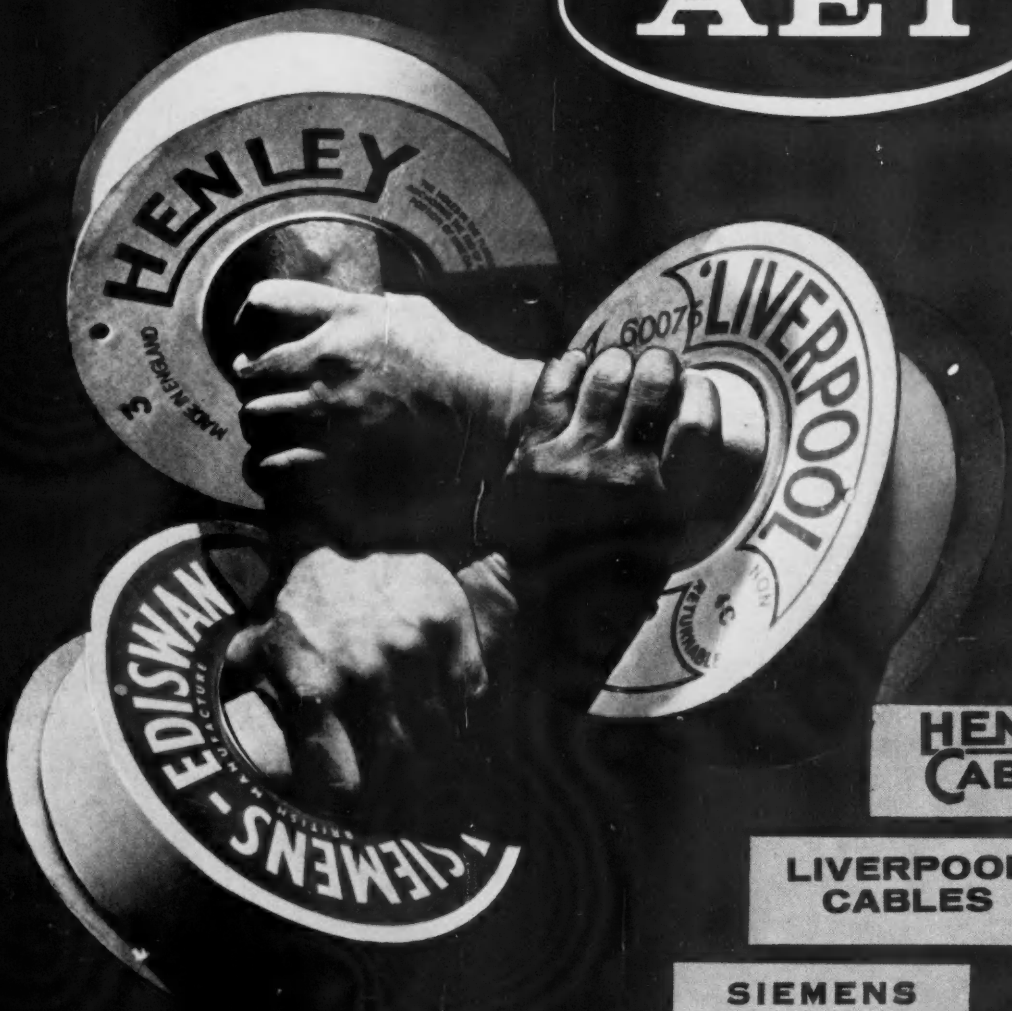
ELECTRICAL TIMES

AEI



UNITES
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OF
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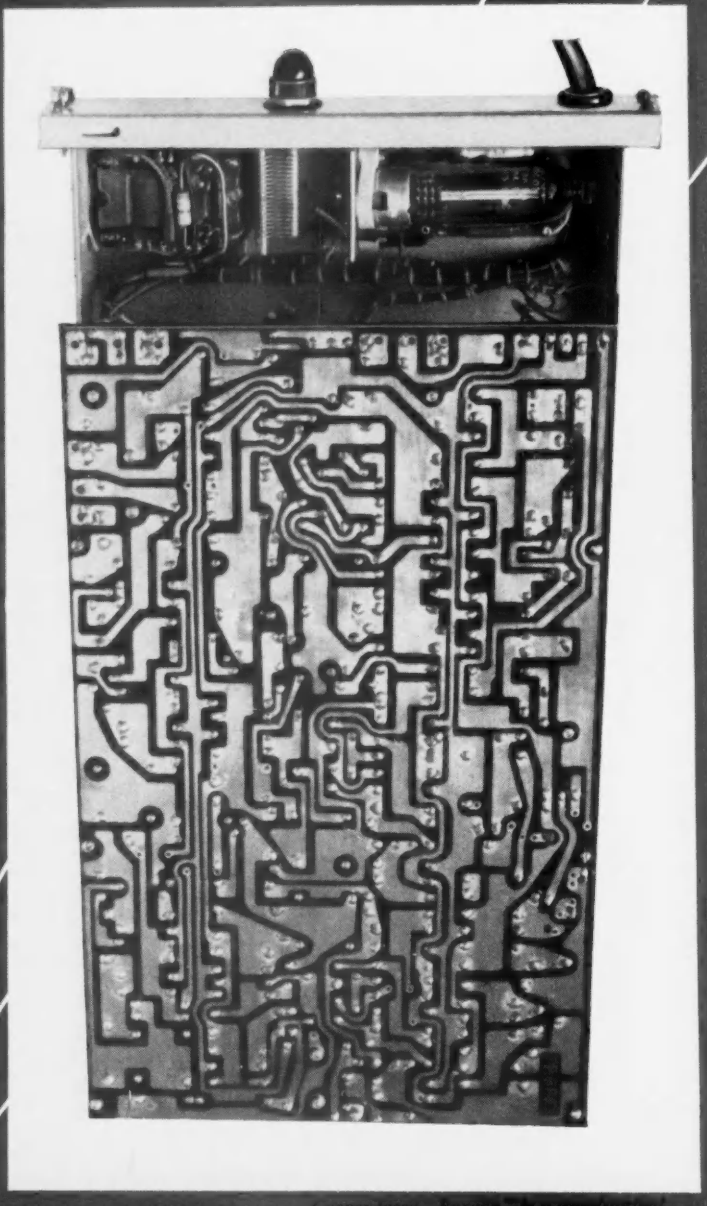
Lines of Communication

Copper faced "Paxolin" is available in three standard grades—
G. Grade; a commercial quality.
NT. Grade; a high-quality punching material.
V. Grade; a material having particularly low moisture absorption.
Use copper faced "Paxolin" for printed wiring in communications, control, electronic and other equipment . . . SAVES SPACE—REDUCES ASSEMBLY TIME—AIDS DIVISION OF COMPLEX CIRCUITS INTO CONVENIENT SUB-UNITS.
Other grades of copper faced "Paxolin" can be supplied if required and our engineers will be happy to discuss particular problems and offer advice.
Please write for our leaflet on copper faced "Paxolin".
"Paxolin" is a registered trade mark.



Copper-faced "Paxolin" is a translucent carrier unit of the MC10 V.H.F. Radio Telephone Terminal. Photograph by courtesy of A.E.I. Telecommunications Division.

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the electrical insulation people

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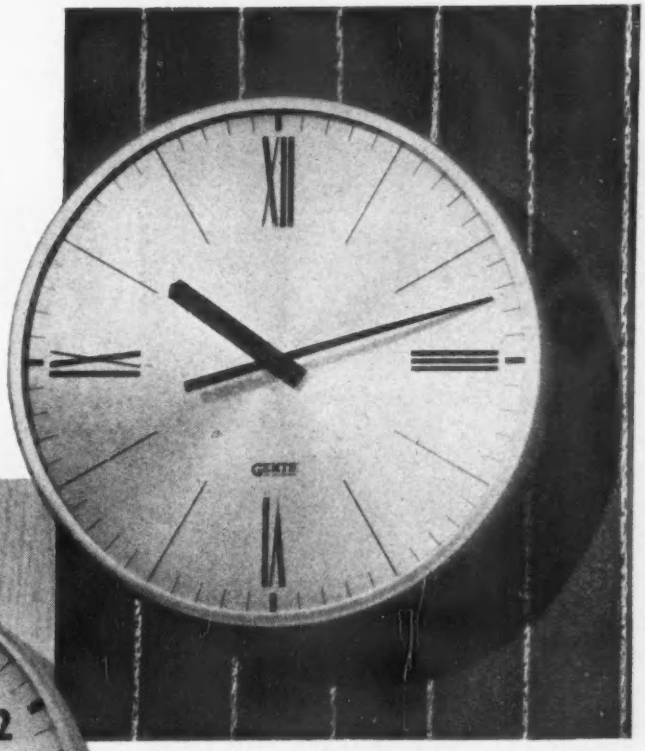
EMPIRE WORKS BLACKHORSE LANE, WALTHAMSTOW, LONDON, E.17.
Tel: Larkswood 5588. Grams: Mytilite, London. Telex. Telex: 28155

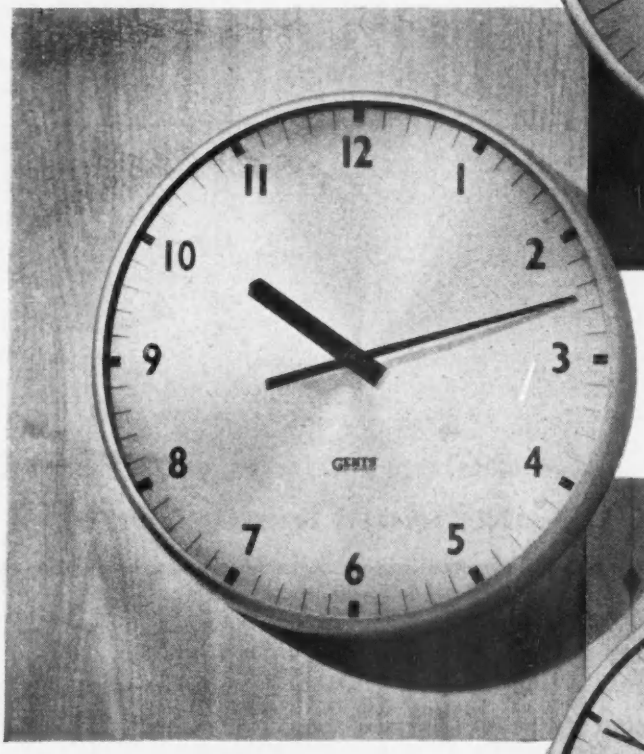


Maximum legibility and good taste are combined in the Gents wall clocks shown here.

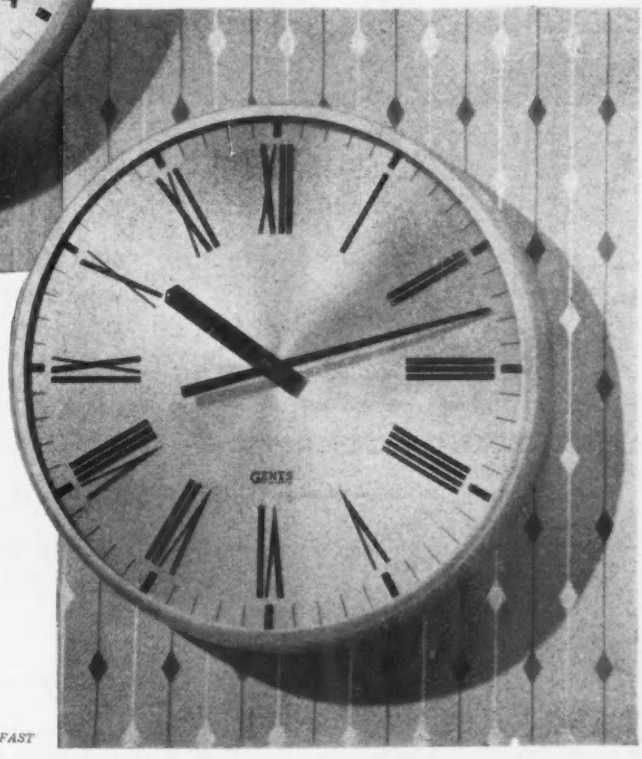
Styled by a leading industrial designer they provide a choice of standard models which fit happily into present-day surroundings and décor.

These and others in the extensive Gents range have been selected by the Council of Industrial Design for inclusion in Design Index.

All are available for operating either on A.C. Mains or as part of a Master Clock System.



In every way...Right!



Most models are now available from stock

Full details and literature on request

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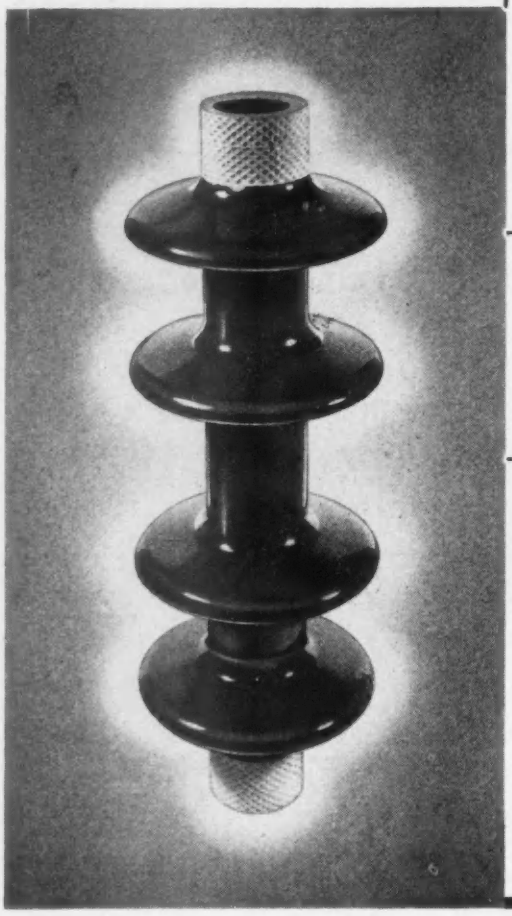
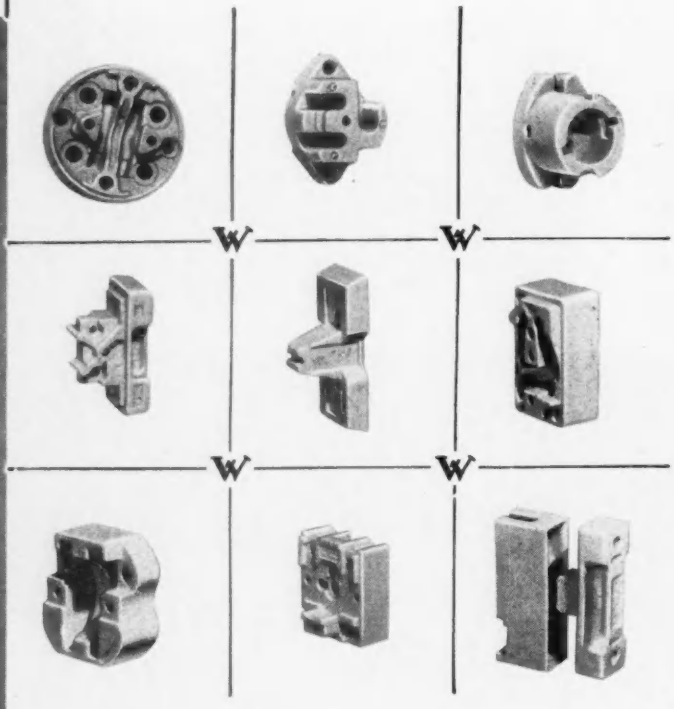
5 x 12 equals 6 x 10 but...





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ELECTRO-CERAMICS

Geo. Wade & Son Ltd., Burslem, Stoke-on-Trent,
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Members of the WADE Group of Potteries

That is a fact—a fact which is proved more and more convincingly, as new materials come and go. Wade have specialised in the manufacture of electro-ceramics from the earliest days of electrical development and enjoy an unsurpassed reputation for accuracy, reliability, and fair price.
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- A RANGE OF S.P. & N. MAIN SWITCHGEAR FOR MODERN DOMESTIC INSTALLATIONS.
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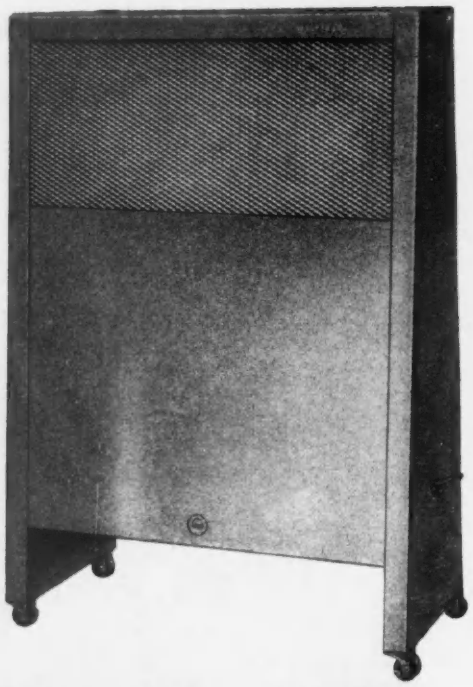

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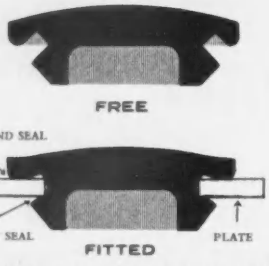
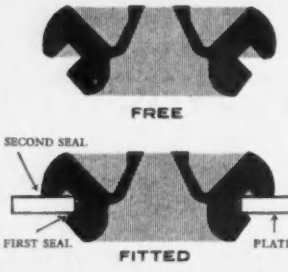
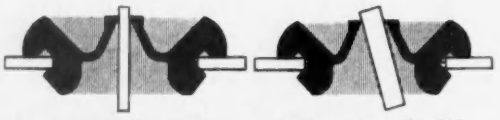


THE NEW DESIGNED GROMMET



This grommet provides a thoroughly efficient seal. Around the panel hole the first seal is effected while a good, tight *second* seal around the top periphery is set up by tension. In the grommets designed for cable entry the internal seal is applied within the conical section. All grommets can be fitted to various panel thicknesses—thus reducing the range.



Large grommet in use, sealing a thin control rod

Small grommet, sealing thick cable at angle

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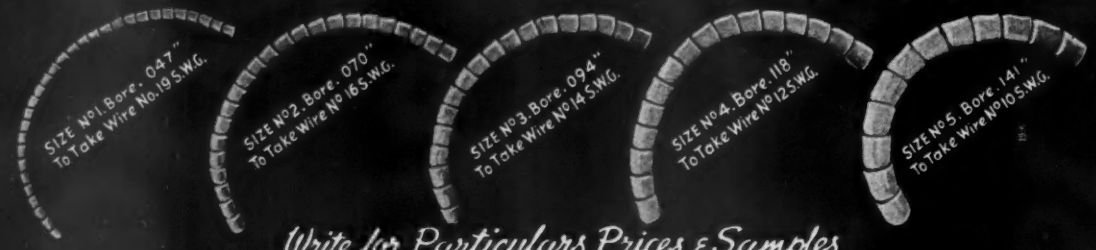
SIZE No1. Bore .047" To Take Wire No.19 S.W.G.
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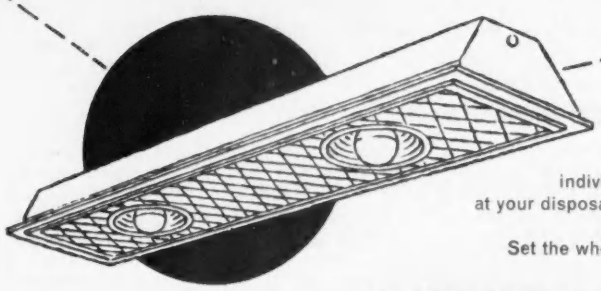

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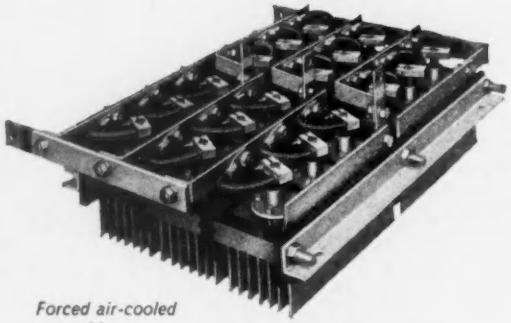
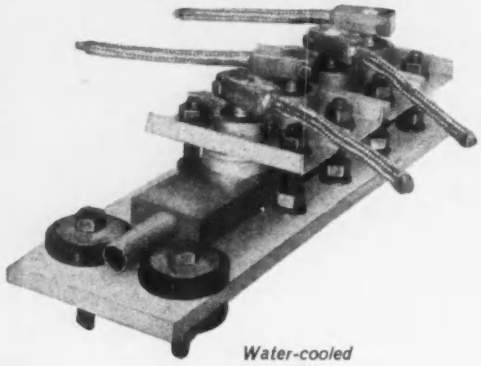
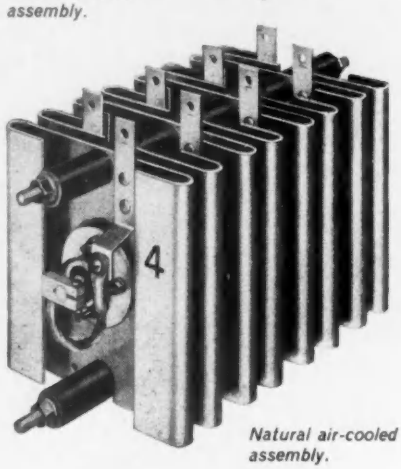


Forced air-cooled assembly.



Water-cooled assembly.



Natural air-cooled assembly.

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HIGH VOLTAGE	100–1,000 volts p. i. v.	WIDE TEMPERATURE RANGE	Can be operated in ambients between −40 and +100°C.
HEAVY CURRENT	Up to 120 amperes.	HERMETICALLY SEALED	Ensures dependable operation despite humid or deleterious conditions
EFFICIENT	Up to 99 per cent.	VOLUME	Small size. Low weight.
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S & L will be pleased to discuss any problems associated with clean conditioning of industrial components.

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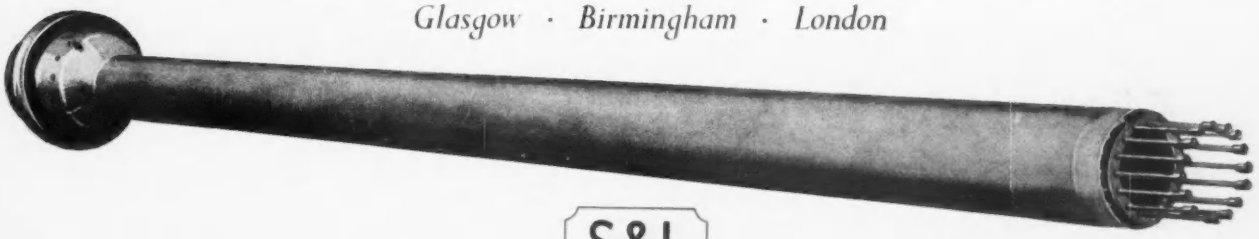

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The core of a fine generator– with laminations by RTB

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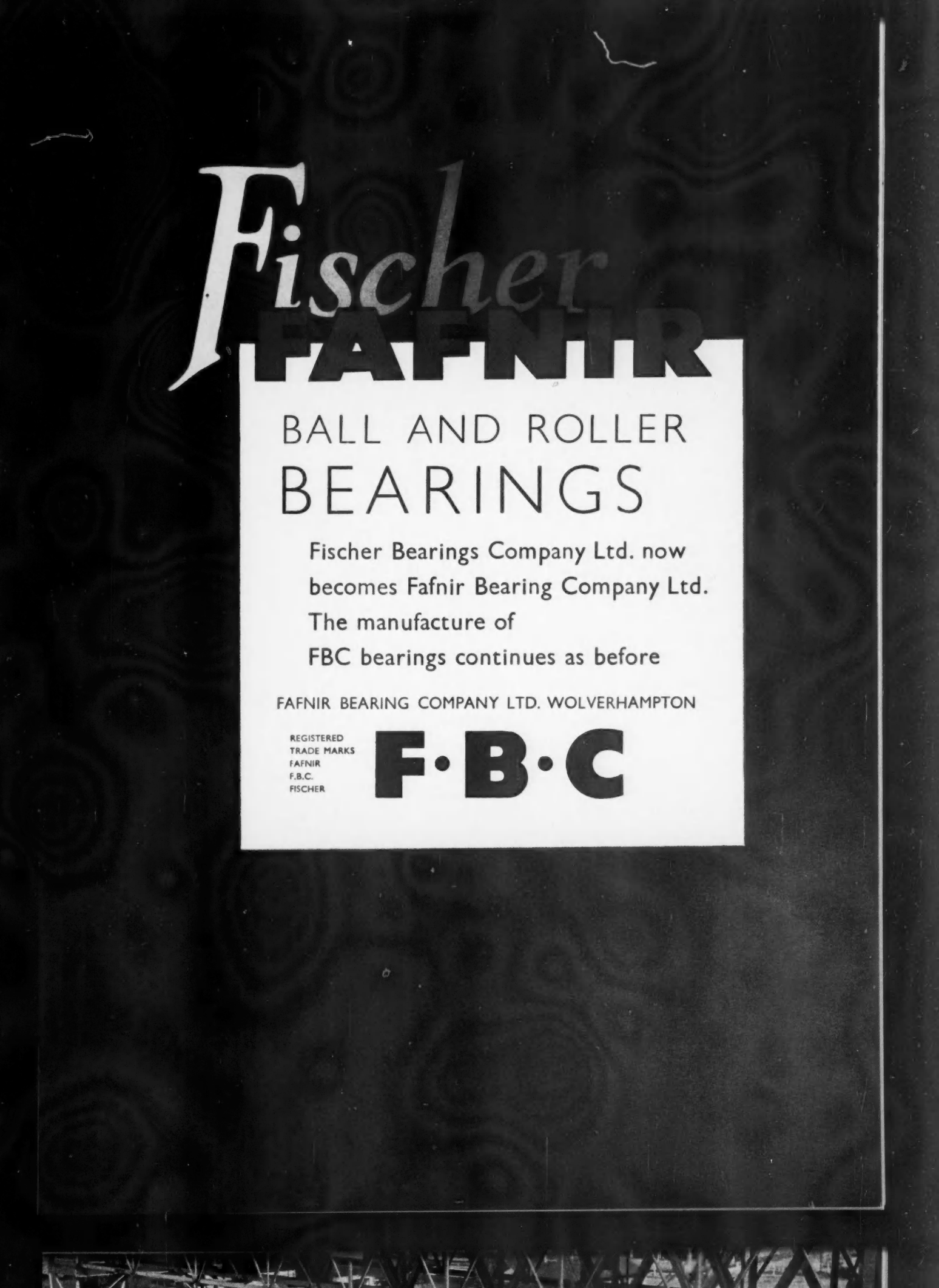
Our Cookley Works is one of the largest in Europe specializing in the manufacture of laminations for the electrical industry.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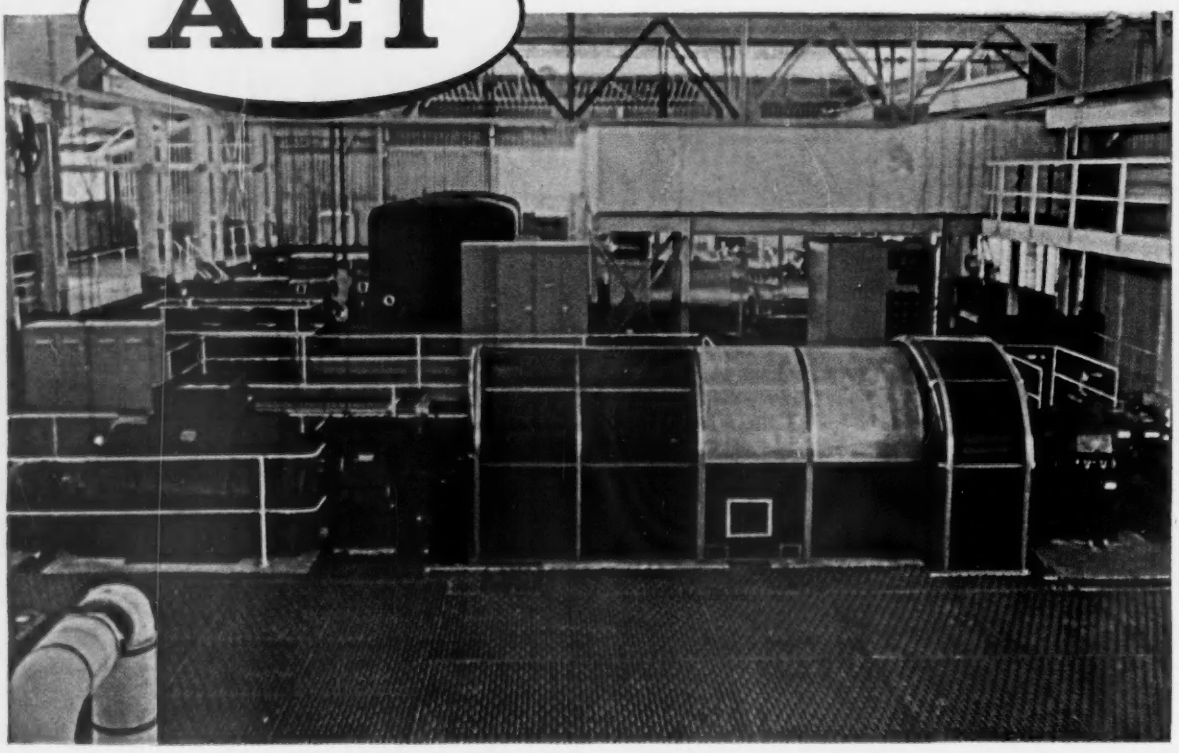

1750 kW GAS TURBINE-GENERATOR

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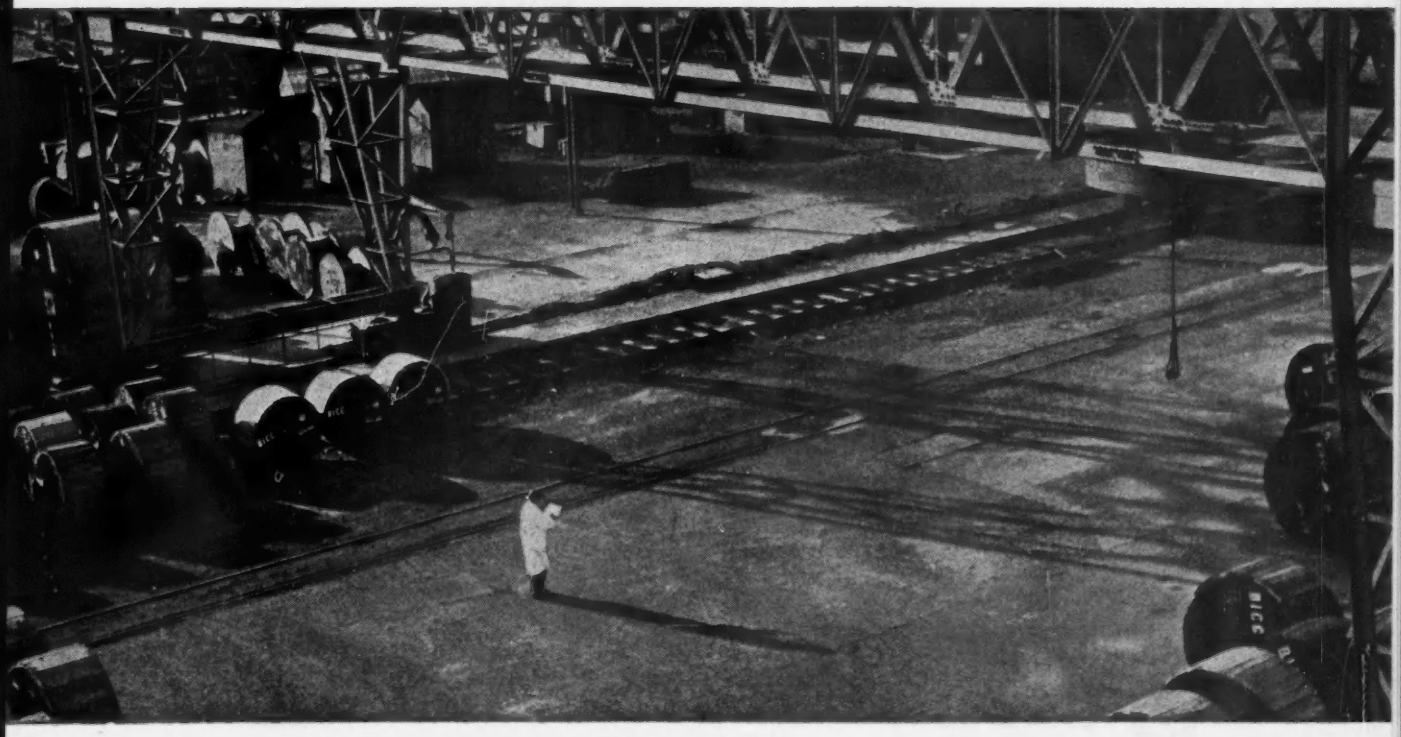

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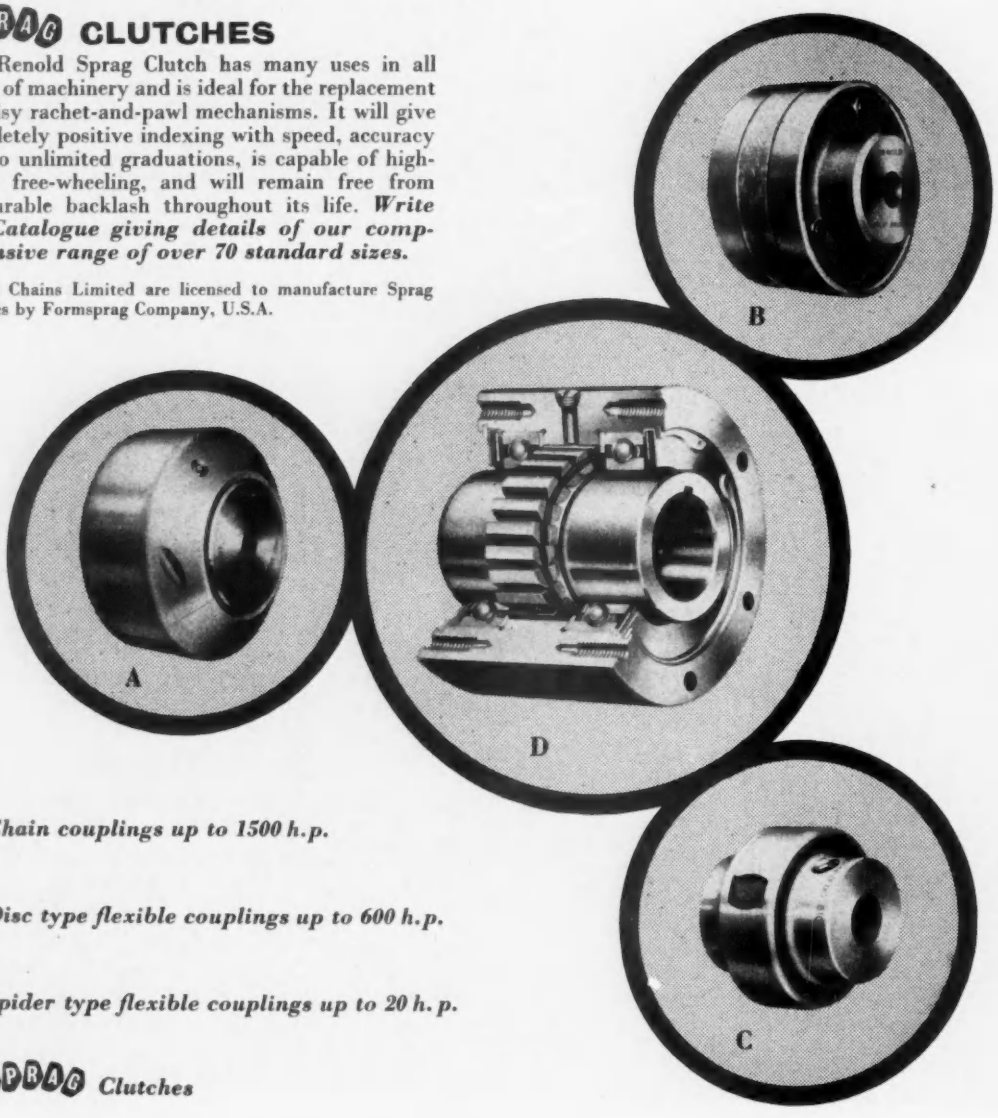
Renold Chains Limited are licensed to manufacture Sprag Clutches by Formsprag Company, U.S.A.



A *Chain couplings up to 1500 h.p.*

B *Disc type flexible couplings up to 600 h.p.*

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"but not WOOTTON METER BOARDS Sir"

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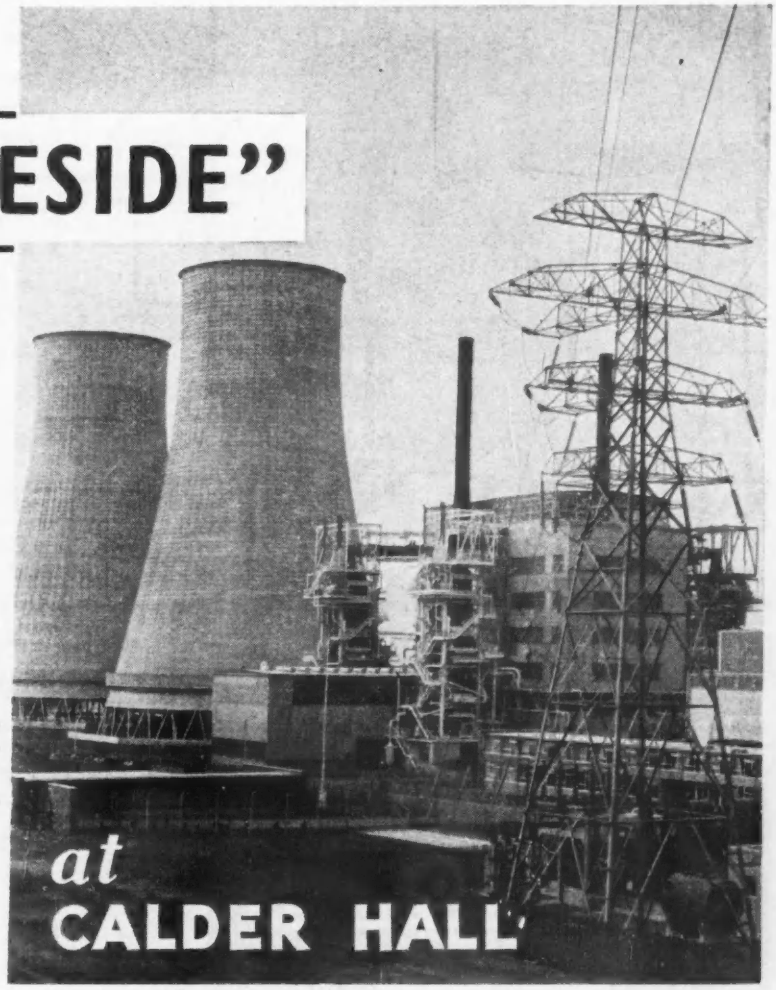

Photo by courtesy U.K. Atomic Energy Authority

With the advancement of Atomic Power, cables must play an important part in the efficiency and reliability in the production of Nuclear Energy. Only the best is good enough and Wandleside Cables are eminently suitable.

WANDLESIDE CABLES *for Nuclear Energy*

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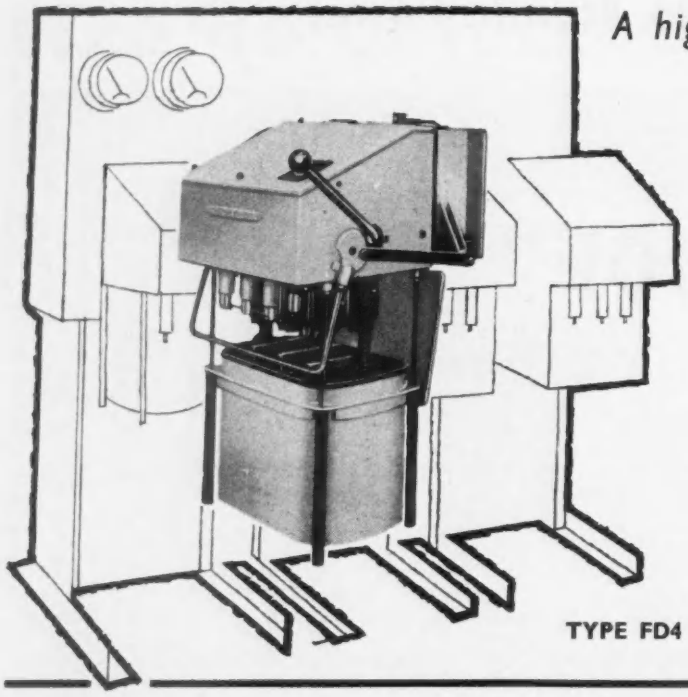

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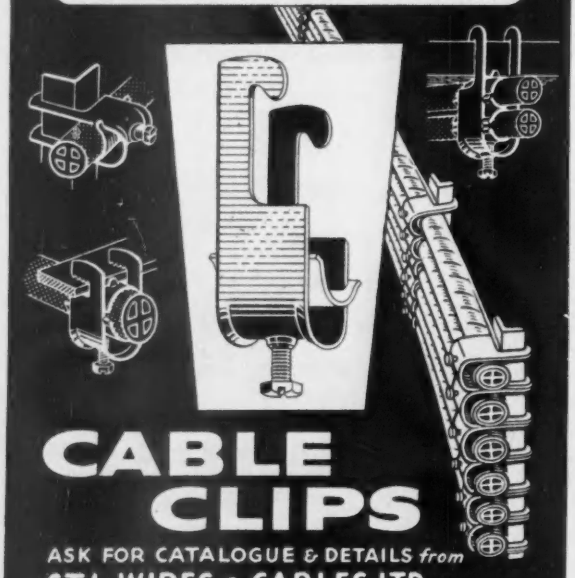

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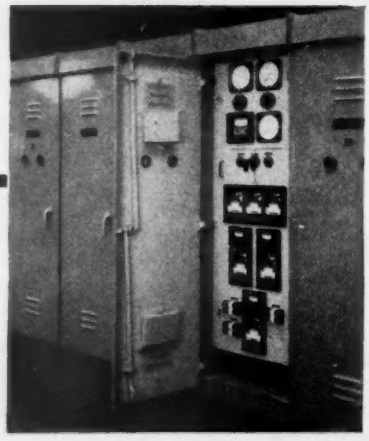

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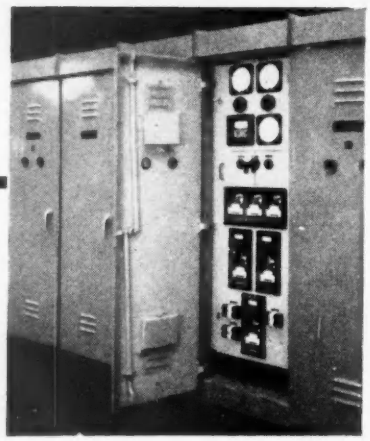

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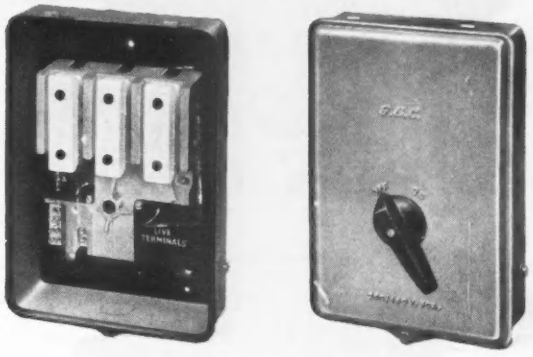

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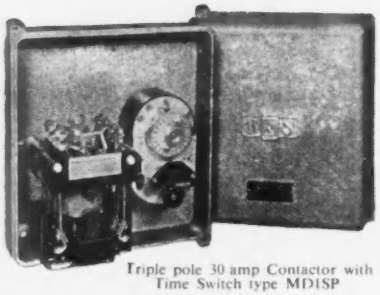

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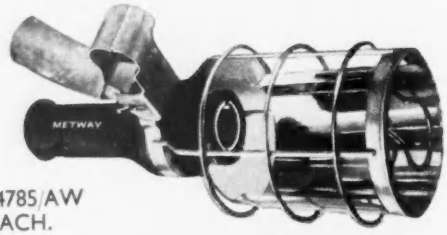

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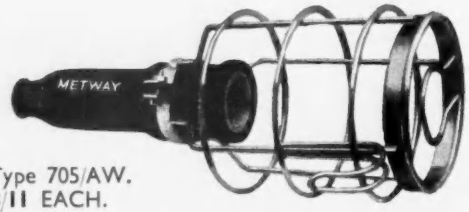

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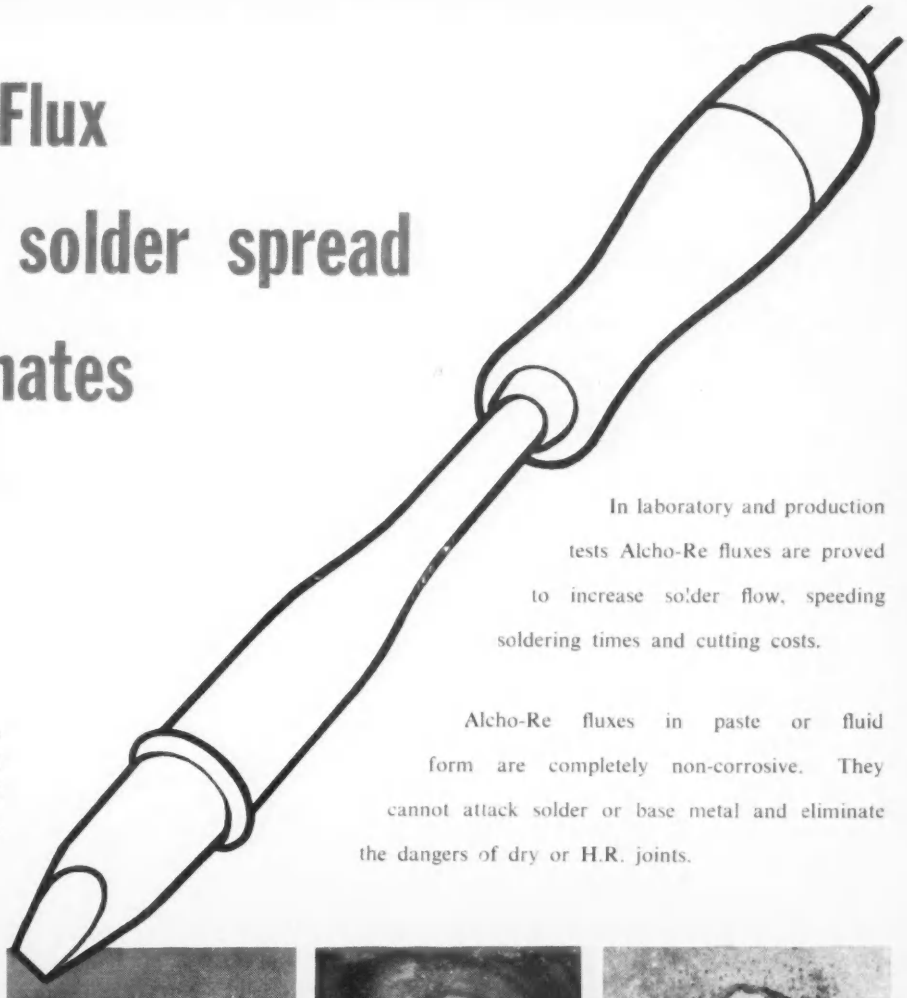

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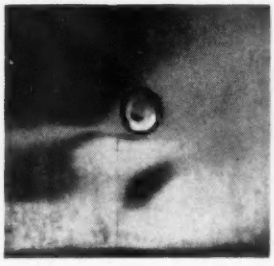
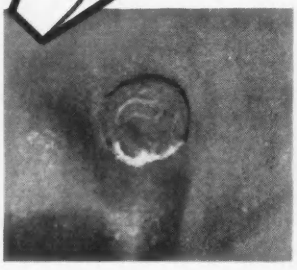


Plain resin flux restricting solder flow.



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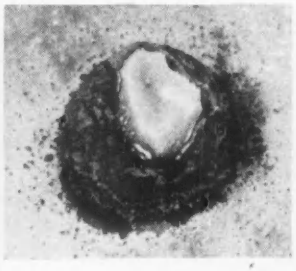

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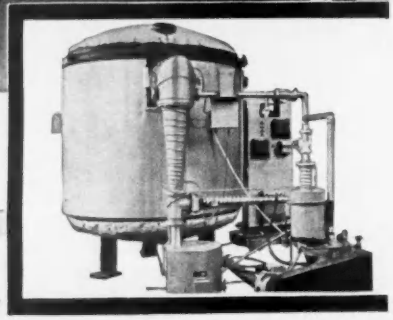

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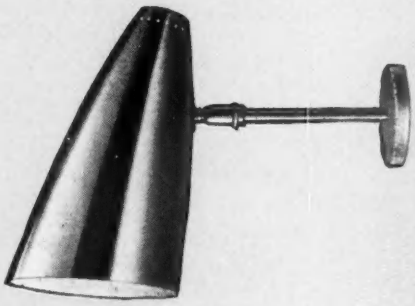

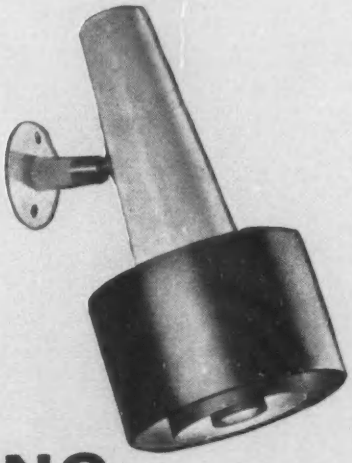

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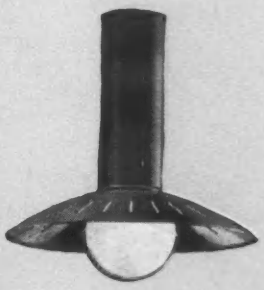

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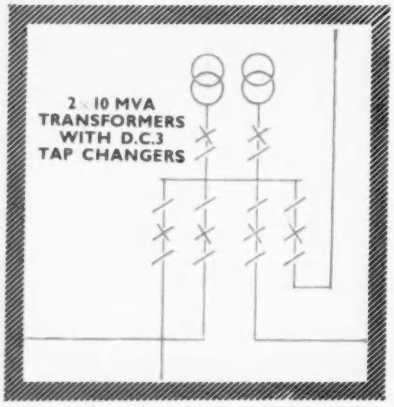

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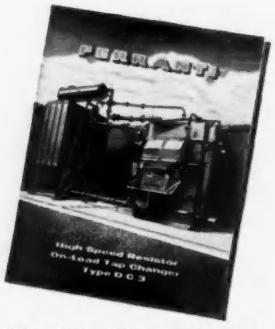

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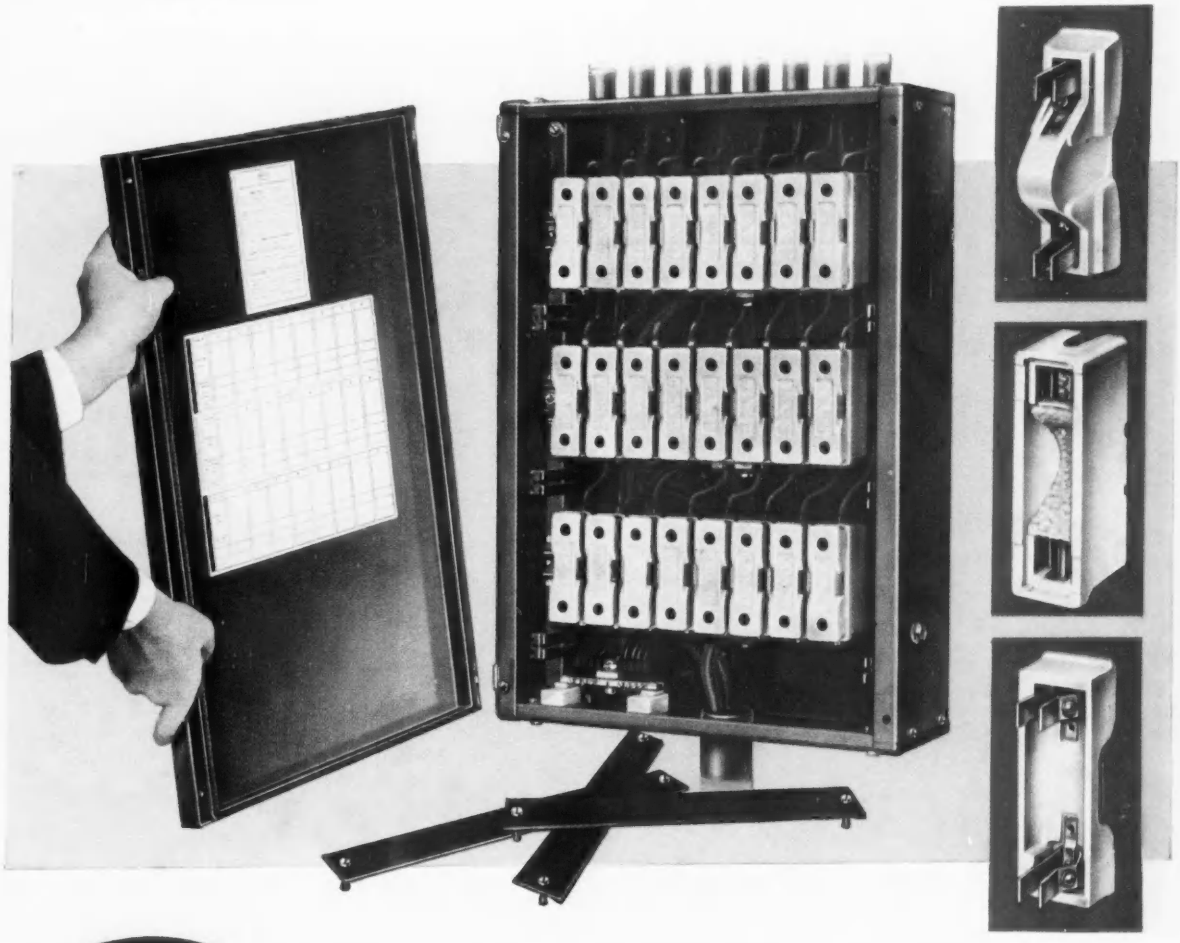

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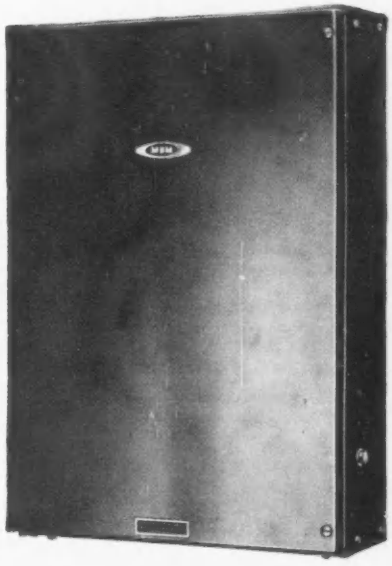

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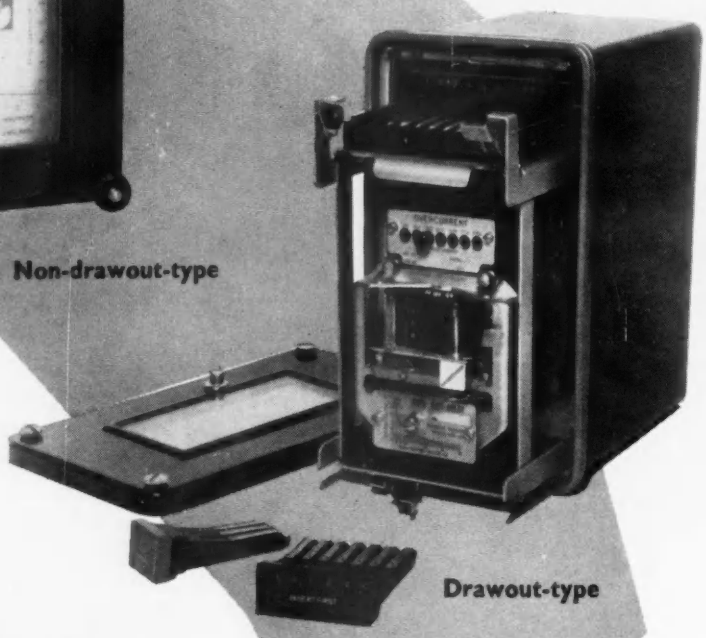

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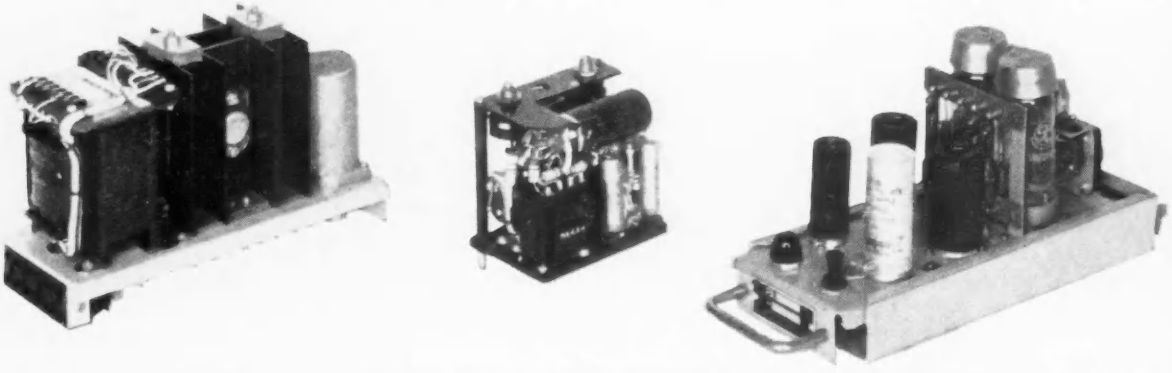

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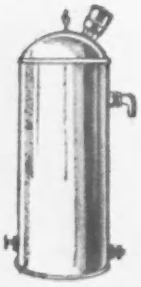

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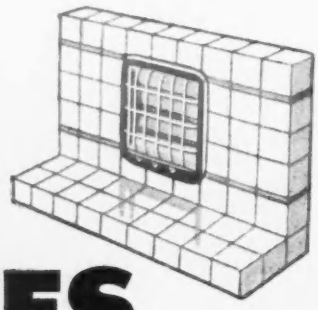

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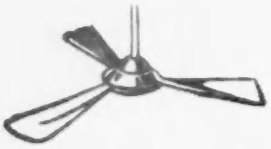

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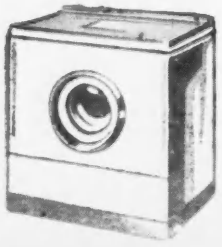

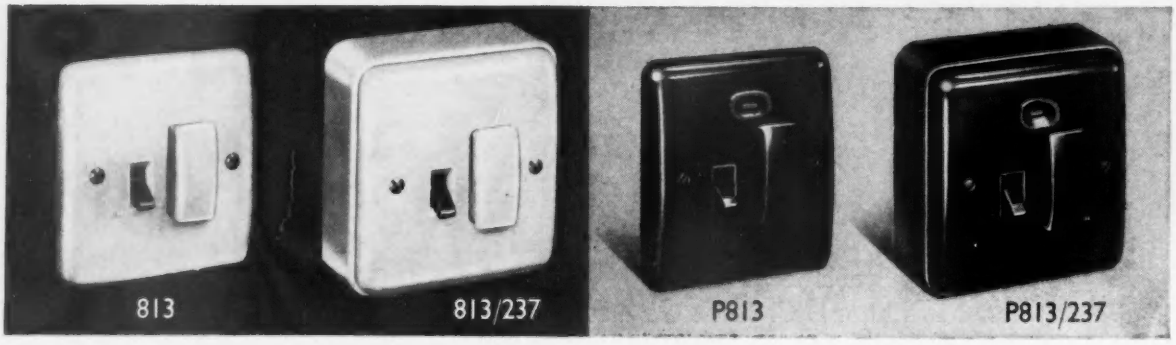

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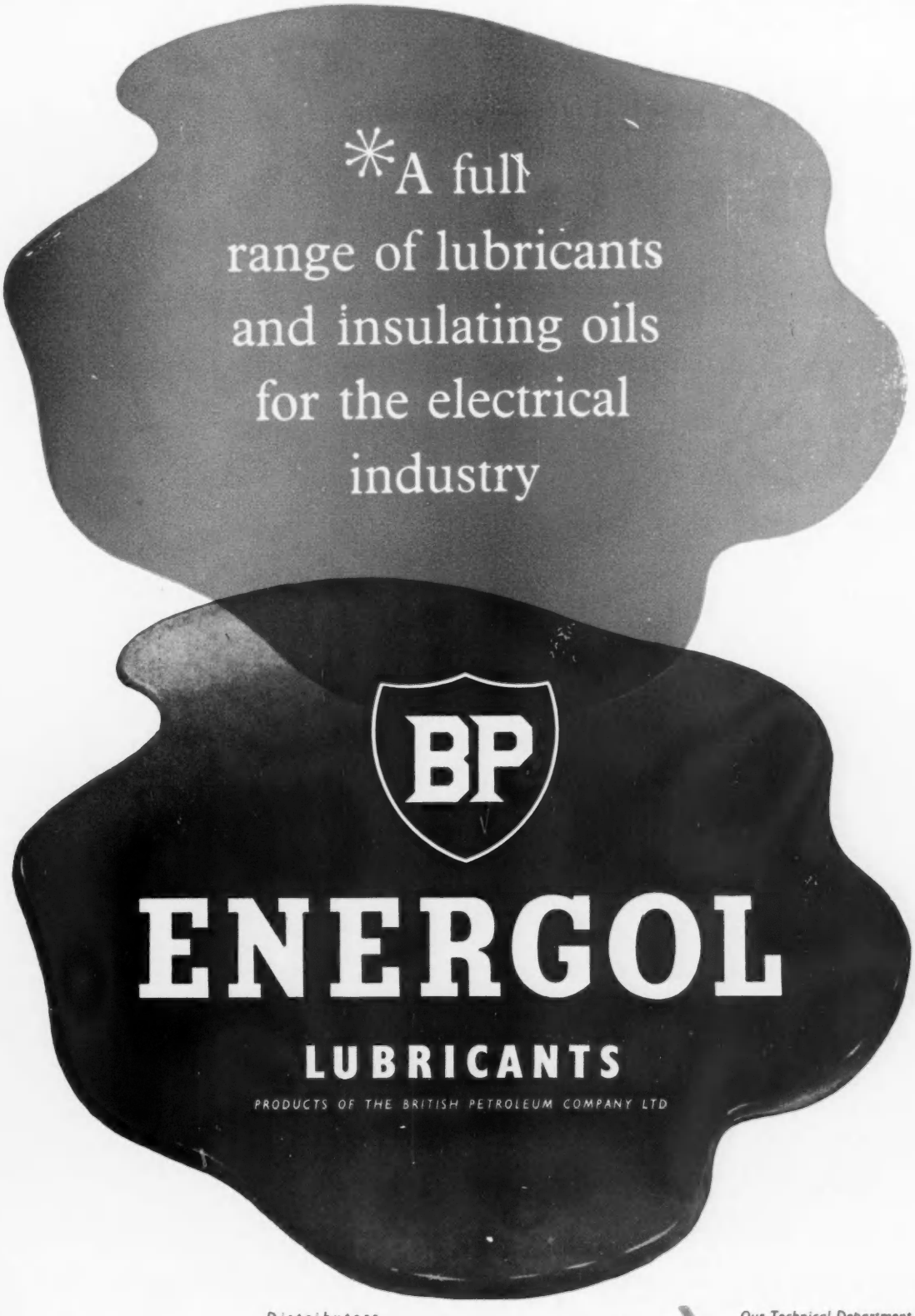

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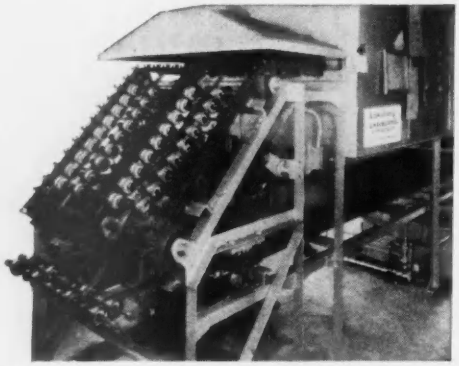

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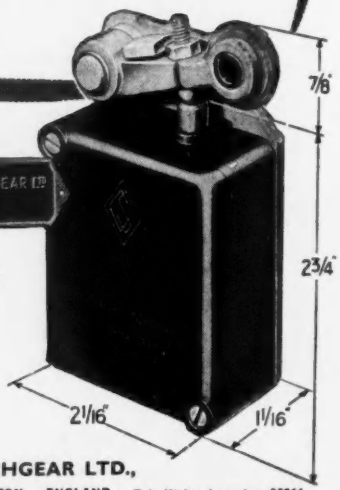

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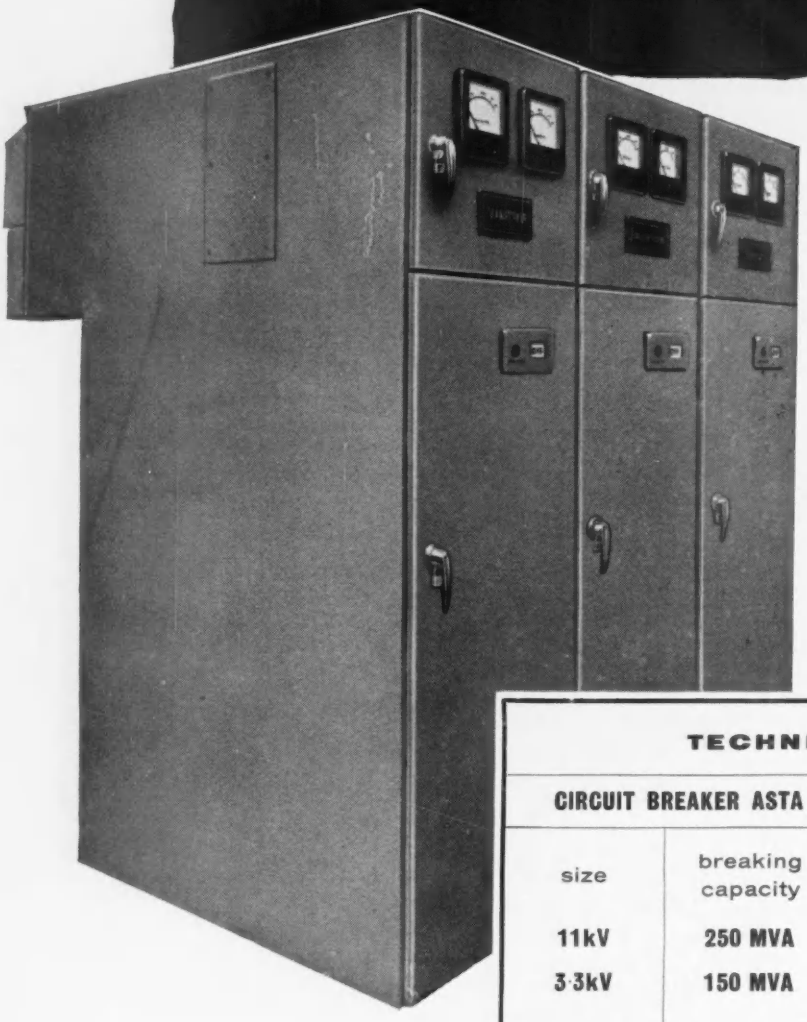

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ELECTRICAL TIMES

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Dans ce numéro

Erreurs dans les installations électriques, I. ... 201
Quelques-unes des dérogations les plus courantes aux prescriptions des règlements britanniques relatifs aux installations électriques intéressent les terminaisons et liaisons des câbles. Des exemples illustrés par l'ingénieur technicien à la tête de l'organisation nationale d'inspection, suggèrent les points sur lesquels les instructeurs devraient insister.

L'électricité dans les régions rurales 207
Dans le but de réduire les frais dans une partie de l'Angleterre orientale, l'électricité est amenée dans des régions pas encore desservies, en développant des zones relativement étendues, au lieu de prolonger simplement des lignes existant déjà, sur des longeuers d'environ 3 km. vers des secteurs de population plus dense.

Fils de terre anti-foudre pour les lignes aériennes ... 208
La position des fils de terre dans les lignes électriques aériennes doit être telle qu'elle tient compte du rapport entre la charge de la prédécharge pilote d'un coup de foudre et les flèches montant du fil de terre ou des conducteurs phasés. La théorie montre que, bien qu'une protection ne puisse être assurée pour tous les coups de foudre, la fraction de ceux-ci pour lesquels la protection est effective, varie de zéro, avec le fil de terre dans le plan horizontal du conducteur, à l'unité lorsque le fil de terre est placé verticalement au-dessus du conducteur. Un angle de 45° assure une protection adéquate.

Câbles sous-marins de 170 kV. 210
Un câble plat "Mollerhoj" de 2 km. de longueur, récemment posé et traversant le Fiord de Kolding, reliera des sections du réseau électrique danois de 170 kV, actuellement en cours d'installation. Le câble a une capacité de 215 MVA en triphasé et il a été posé en quatre tronçons enroulés sur un tambour rotatif de grande dimension.

In dieser Nummer

Verdrahtungsfehler—I 201
Die am häufigsten vorkommenden Abweichungen von den in Grossbritannien für elektrische Installationen geltenden Vorschriften betreffen Kabel-endanschlüssen und -Verbindungen. Vom technischen Leiter der Landes-Prüfstelle angeführten Beispiele weisen auf die Rolle hin, die der Unterricht an den Gewerbeschulen beim Beheben dieser Mängel erfüllen könnte.

Stromversorgung in ländlichen Gegenden 207
Als Sparmassnahme wird die Stromversorgung neuer Gebiete in einem Teil Ostenglands dadurch bewerkstelligt, dass relativ grosse Netz-Zonen angelegt werden anstatt bestehende Leitungen bei Bevorzugung der am dichtesten besiedelten Strecken um etwa 3 km zu verlängern.

Erdungsseile als Blitzschutz für Freileitungen ... 208
Die erforderliche Lage der Erdungsseile in bezug auf den zu schützenden Freileitungen hängt ab vom Verhältnis zwischen der kritischen Ladung, die zum Entstehen eines Blitzschlages ausreicht, und den von den Erdungsseilen oder den stromführenden Leitungen nach aufwärts gehenden Strahlern. Obwohl theoretisch ein wirksamer Schutz gegen jeden Blitzschlag nicht zu erreichen ist, schwankt in der Praxis die Wirksamkeit des gewährten Schutzes, als Abwehrziffer ausgedrückt, zwischen Null wenn das Erdungsseil in der gleichen horizontalen Ebene wie die stromführende Leitung liegt und Eins wenn das Erdungsseil senkrecht oberhalb der Leitung liegt. Eine Verlegung des Erdungsseils in die Mitte (45°) zwischen diesen extremen Lagen ergibt einen ausreichenden Schutz.

170kV Unterwasser-Kabeln 210
Ein 2 km langes Mollerhoj-Flachkabel, das unlängst im Kolding-Fjord gelegt wurde, ist dazu bestimmt, Abschnitte des dänischen 170-kV Starkstromnetzes, an denen noch gebaut wird, mit einander zu verbinden. Das für eine drehstromführende Leistung von 215 MVA konstruierte Kabel wurde in vier Teillängen von einer grossen Drehspule aus gelegt.

Eliminating Installation Faults by Instruction—Part 1 201
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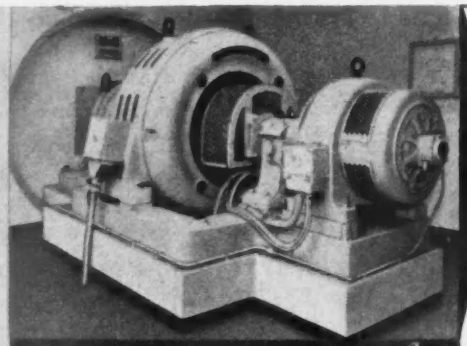

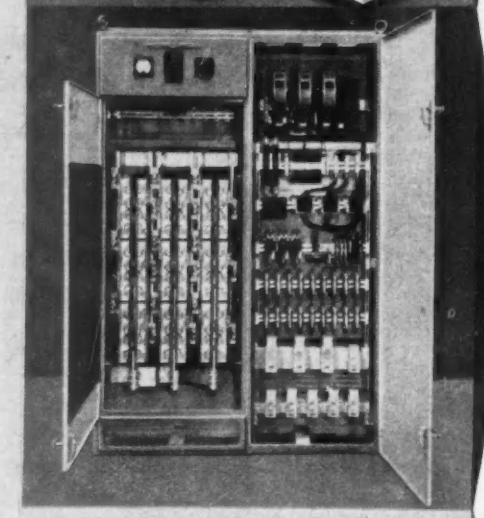

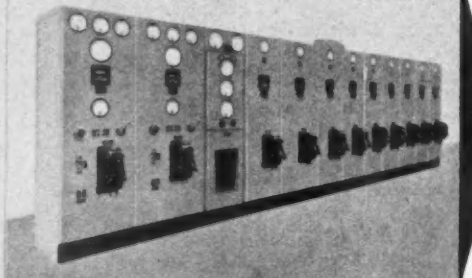

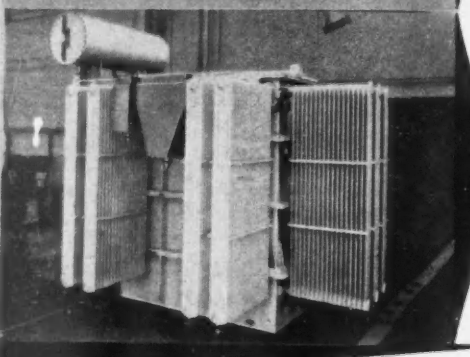

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ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 11 FEBRUARY, 1960

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T. W. WRIGHT

Comment

NEW PROBLEMS IN RURAL SUPPLY

Eastern EB chairman, Mr H. V. Pugh, highlighted an important change in the problem that rural electrification presents to the supply industry, when, last week, he spoke of the shift of emphasis from getting electricity to the rural population, to getting the country dwellers to use more electricity so that rural electrification becomes a paying proposition. The Eastern EB, for example, has increased the proportion of farms supplied from just over 30% at vesting day, to 80%. Many other boards have achieved the same order of saturation. There is some hard work to be done in pushing the figure up further, and it has to be recognised that in some of the more remote areas, 85% may be the practicable limit with present techniques. A change in planning approach is helping mop up the last sectors of unelectrified country; the trend in the EEB and elsewhere, is to zonal electrification, where a defined area is equipped for electrification, down to a considerable degree of remoteness, rather than the prior plan of working radial extensions always along the more populous of the remaining possible routes. There is a worth while economy in the zonal method, for men and machinery can be concentrated, and used to greatest effect with minimum transport of heavy equipment. But the line construction teams who are playing so important a part in these schemes are themselves posing something of a problem for electricity boards. It is becoming necessary to give detailed consideration to the way in which the staff of these teams can best be re-deployed in the not far distant future as the intensive rural construction slows down.

LIGHTNING CONUNDRUM

Lightning remains the principal cause of outages on high-voltage transmission lines, so anyone who can produce a theory offering a cure for those supply interruptions is sure of a careful hearing. There was certainly a lively discussion at the IEE meeting last week, at which such a theory was advanced; a theory which offered mathematical approval for the long-established rule of providing an angle of not more than 45° between phase wire, earth-shield wire and the vertical. The tenor of the discussion was that the theory presented did not fit all the facts, that 45° was not working in every case (though the author countered tellingly by questioning whether the 45° demanded was always secured in practice, even when specified). Indeed, a whole welter of new evidence is appearing demanding modified thinking in this field of protecting transmission lines by the relatively simple technique of earth-wire shielding. For long, the statistics of lightning trouble

on transmission lines in this country have indicated that the higher the supply voltage, the lower the lightning fault rate; but the advent of 275 kV has reversed this trend, and introduced much concern for behaviour of the 380 kV and higher voltage lines now under consideration. Again, collected experience on a world-wide basis strongly suggests that angles of less than 45° prove increasingly advantageous in preventing lightning strikes on phase conductors; that there is no magic in that convenient figure, no loss of increasing effectiveness once it is passed. The study of lightning effects on transmission will clearly need to continue; meanwhile there is the comforting thought that developing techniques, such as high-speed auto-reclosing, can do much to limit the trouble lightning causes, even on major lines at the highest voltages.

GETTING THE REGULATIONS RIGHT

In countries where there is a statutory practical and written test for electricians, examination results provide a check on the standard of instruction in technical colleges, as well as on the competence of the candidates. It is noticeable in the published reports of the New Zealand examiners, for example, how particular types of deviations from wiring regulation requirements are emphasised as being prevalent over a large proportion of examinees and deserving of more attention by teachers. In the UK, it is not easy to organise such a central judgment; and, indeed, the necessary and in many ways excellent reliance on part-time teachers from the installation industry for formal training of electricians to City and Guild syllabuses, carries a risk that misunderstandings on the part of the instructors may be perpetuated. Where the teachers can find a check is in the experience of installation inspectors of their pupils' work; and here a central clearing house for results is available in the National Inspection Council for Electrical Installation Contracting. The council's useful check-list of common installation faults has been made available to technical colleges teaching electrical installation for some time, and this week we begin an article by the Chief Technical Officer of the Council, which extends the experience gained on the job to the special requirements of the teacher. But although the article is specifically directed there, it makes salutory reading for most engineers who think they know the IEE Regulations well. Deviations from requirements slip in so easily, and it needs the uncommitted observer sometimes to spot their effect.

MOTORWAY PREVENTION OR CURE?

Once the decision was taken to leave the early motorways without public lighting, it was certain that drivers using them at night would carry out much of their journey with headlights raised. Dazzle followed automatically, and now experiments on a trial stretch of two miles are being quoted in favour of a 5 ft 8 in. high steel mesh screen between the two carriageways, as a precaution wherever dazzle has proved a problem on the road. The cost of this precaution? £3,500 a mile according to one national newspaper report, apparently based on information offered by the manufacturers of the screens. The figure is significant, since it has been suggested by the Association of Public Lighting Engineers that it would cost only £4,000 a mile to provide reasonable continuous road lighting on this type of traffic route. No doubt the exact figures can be argued, but the incidental advantages of a positive step, such as lighting, would surely combine with its leading qualities to give it a decisive claim if any extra spending is decided on. In particular, there would be the avoidance of the sudden change in conditions that will follow if the road complexes, where there is access to and exit from the motorway, are lighted (a point currently under discussion), and then the lighting is tailed off. Although continuous lighting would not entirely solve the headlamp dazzle problem, unless drivers stepped up their courtesy, it would do a great deal to reduce it.

TOP TECHNICAL TEACHERS

A staff college for the up-and-coming technical teachers who will provide principals and heads of departments in Britain's expanding technological education service is an idea that has much to commend it. There are clearly many ways of realising such an idea, and the suggestions put forward last week by Sir Alexander Fleck will occasion widespread discussion. He has made it clear, in appealing to industry for financial support for such a foundation, that the accent will be on mutual studies by teachers and a smaller number of executives from industry and commerce in residential courses. There will be no formal teaching; the technique of study will be free exchange of experience on teaching methods, on the needs of industry for particular kinds of training and education in its recruits and post-graduate students, and on administrative techniques in education. This is a scheme which fits well with the idea of relatively short courses, of two to four weeks' duration, for which local education authorities are more likely to be willing to release their teachers than for year- or term-long courses. It also keeps clear of the separate question of keeping senior teachers up to date with technological advances, which has been successfully tackled by large firms, in the electrical industry at least, by professional summer schools, and which can be extended through closer research links between technical colleges and industry. Though the numbers passing through the proposed college every year would be relatively small, perhaps 200 a year out of 17,000 full-time technical teachers, the effect they would have on purpose and efficiency of technical education might be quite out of proportion.

Meteor

This week's quick summary of electrical news faces advertisement page 20.

Eliminating installation faults by instruction

PART 1—by E. J. Sutton,* M.I.E.E.

THE evening teaching session is now in full swing and it has been ascertained that approximately 230 technical colleges, colleges of further education and other establishments teaching technical subjects, are providing courses of instruction for electrical installation work. These courses were drawn up by the Advisory Committee on Electrical Installation Work, formed jointly by the Electrical Contractors' Association (Incorporated) and the City and Guilds of London Institute and comprise:

Course B: For students of 16 years or over, leading to (a) an Electrician's Interim Certificate, and (b) an Electrician's Certificate, and

Course C: Leading to (c) an Electrician's Interim Extra Certificate and (d) an Electrician's Extra Certificate.

Full details on the regulations and syllabuses valid for the examinations to be held in the current year are available† The details of the courses and requirements to be fulfilled by the student before he may receive any of these awards appear to be only vaguely understood in some quarters, so a brief outline of the essential features of the two courses may be of help before this article comes to its main purpose, considering common installation faults in relation to formal instruction.

Course B

Subject to the student satisfying the authorities of the school or college concerned that he is qualified to take Course B, (a preliminary course of instruction at an evening continuation school or technical college will meet with these requirements), he is required to attend for three evenings a week, (or the equivalent in the daytime), over a period of three years. At the end of the course the student should have acquired the necessary technical knowledge which, coupled with his practical instruction during the course, and in his day-to-day work, will enable him to function as a competent journeyman electrician.

For the first and second years of the course, one evening of the three per week is allocated to electrotechnology, one to sketching and calculations and the third evening to regulations and installation technology. During the third year, two evenings are given to regulations and installation technology and the third evening to sketching and calculations.

Since the main purpose of this article is a consideration of the instruction given under "regulations and installation technology," it is pertinent to record some of the sections of the syllabus in which the National Inspection Council for Electrical Installation Contracting is primarily interested.

The first year syllabus includes:

What the electrical installation provides. The necessity for regulations—safety of life and property.

The need for protection against (a) excess current, (b) shock, (c) fire, (d) corrosion, (e) mechanical damage, (f) leakage.

Simple testing for continuity of current carrying conductors and of their insulation.

The second year of the course includes:

Installing and fixing of conductors and cables and selection of runs. Types of wiring systems used in installation work. Earthing systems.

The planning of final sub-circuits (Regulations 112-116). General application of diversity factors (Regulation 111).

Testing of installations including tests for insulation at various stages, continuity and polarity of current carrying conductors and for continuity of earth continuity conductors. Tracing circuits and testing for location and remedying of faults.

In the third and final year of the curriculum, the above subjects are given wider application with respect to installation of motors, generators, transformers and other power equipment. In addition, various types of distribution systems are dealt with including telecommunication systems and the installation of electric signs, discharge tubes and lamps (Regulation 701-708).

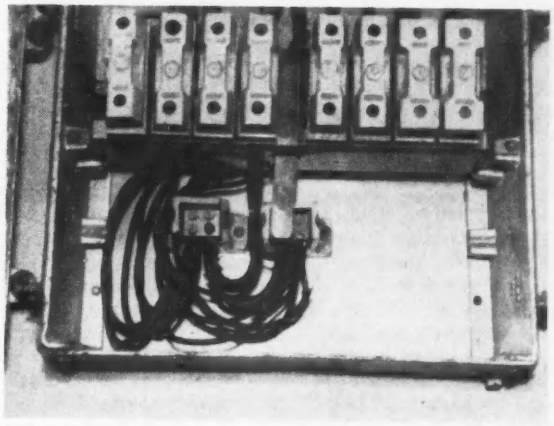

Fig. 1. Indiscriminate bunching of neutral conductors at a fused distribution board. This is one of the common faults commented on

The practical work for Course B provides for instruction in the installation of different systems of wiring, including connections to accessories, switchgear, appliances and other equipment.

At the end of the first year and before passing on to the second year, the student must satisfy the technical school or college at which he is attending, that he has attained an appropriate standard before he may be transferred to the second year. Similarly, an appraisement is made by the technical school or college at the end of the second year, before transfer is made to the third and final year.

An examination, consisting of two three-hour papers, set and marked by the City and Guilds of London

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* Mr. Sutton is Chief Technical Officer, National Inspection Council for Electrical Installation Contracting.

† Leaflet 51, Electrical Installation Work, published by the City and Guilds of London Institute, 76 Portland Place, London W.1, priced at 1s, including postage.

Institute, must be taken by the student and, subject to a satisfactory standard being achieved in each paper, the student is awarded the Electrician's Interim Certificate. Due account is taken of practical work that is set and marked by the school during the final year of the course.

To obtain an Electrician's Certificate, a candidate must be not less than 22 years of age, engaged in electrical installation work, and must be in possession of the Electrician's Interim Certificate (Course B as described above); in addition, he must satisfy the Advisory Committee as to the standard of his practical training and work, gained during his day-to-day employment, by submitting a statement to the City and Guilds of London Institute.

Course C

Course C is designed for those wishing to qualify for a higher position such as a foreman or supervisor, and is for those who have passed the final examination for Course B and have obtained the Electrician's Interim Certificate and/or the Electrician's Certificate.

Although under special circumstances a candidate may take the examination upon completing one further year of study after taking his "B" Certificate, the course is intended and designed to cover two years of three evenings each week. Of these, one is devoted to regulations and installation technology (theory and practical) and the other two to drawing and sketching, mathematics and ancillary subjects.

The syllabus for regulations and installation technology includes :

A thorough working knowledge of the current IEE Regulations for the Electrical Equipment of Buildings, together with a knowledge of the Electricity (Factories Act) Special Regulations administered by the Ministry of Labour and National Service, and the Electricity Supply Regulations, 1937, administered by the Ministry of Power.

A thorough knowledge of the principles governing the earthing of non-current carrying metal parts of electrical installations, with special reference to the safety of life and property.

Testing of installations, fault finding and remedial action.

The remainder of the course covers a much wider scope on installation practice generally, including distribution systems, erection and setting into operation of equipment, plant, water heating and space heating.

The practical work for Course C is similar to that designed for Course B, but on a wider and more comprehensive scale.

The transfer procedure from first to second years follows the same lines as for Course B, and in the second and final year of Course C, a similar type examination is taken, the questions being at a more advanced level than for Course B. Subject to satisfactory results being achieved, the candidate is awarded the Electrician's Interim Extra Certificate of the City and Guilds of London Institute and may then submit a further statement of his practical training and work in his day-to-day employment, on a form to be obtained from the Department of Technology. In addition, the candidate must satisfy the Advisory Committee that he has held the Electrician's Interim Certificate (Course B) for at least two years.

Subject to the candidate's training and experience being approved by the Advisory Committee, he is then awarded, by the City and Guilds of London Institute, the Electrician's Extra Certificate.

To those candidates obtaining both the Electrician's Extra Certificate after successfully completing Courses B and C, a Full Technological Certificate is awarded and, by further study, suitable candidates may submit an application for the City and Guilds of London Institute Insignia Award in Technology.

Instruction and Understanding

Although this is the ultimate goal at which the majority of electrical installation students would aim, not all of the 230 establishments previously mentioned are running both Courses B and C. All are doing Course B, a very small number doing the first year or first and second years only, and about 35% of the whole do Course C in addition. Even so, the number of competent instructors and lecturers required to teach electrical installation work amounts to a total of some hundreds.

The majority of these instructors are engaged in the electrical contracting industry or on electrical installation work and are fully conversant with the standards laid down in the 13th Edition of the Institution of Electrical Engineers Regulations for the Electrical Equipment of Buildings (IEE Wiring Regulations). However, from letters and requests received from time to time by the National Inspection Council, it would appear that the current edition (13th), is not so well known as it should be. In fact, it can be said that, in some instances, the 12th edition of this publication is known to be the basis upon which electrical installation work is being considered.

The National Inspection Council has done much to encourage a wider knowledge and understanding of the requirements of the IEE Wiring Regulations by the approved contractors enrolled with the Council, and is equally concerned with the spread of this knowledge to the operatives and staffs employed by these contractors. It was primarily for this reason that the pamphlet "Common Installation Faults" was produced and has since created much interest and had such wide circulation.

Some twelve months ago, after consultation with the National Inspection Council, a copy of this pamphlet accompanied by an explanatory letter setting out the aims and objects of the Council, was sent by the Ministry of Education to the majority of the technical colleges and other institutions running evening classes on electrical installation work.

The National Inspection Council does, of course, acknowledge with grateful thanks this most helpful co-operation from the Ministry of Education and is willing, and anxious, to supplement this preliminary action with further technical information from time to time.

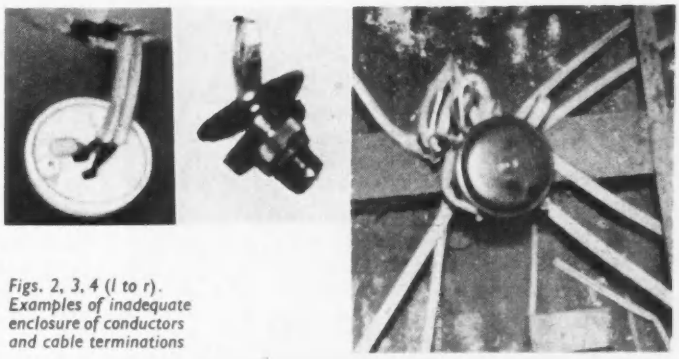
Much has been done to lessen the frequency with which the "common faults" occur on installations and the National Inspection Council has already reported the marked improvement and progress made during its first two years of operation. Nevertheless the common faults continue to be recorded on installation reports and even further education and enlightenment appears to be needed. One way of doing this is through the instruction courses for Electrical Installation Work, particularly on Course B. There is a need for the instructors to familiarise themselves with these "common installation faults" so that particular attention may be given to obviating them when teaching their students, especially in the practical instruction classes.

Common Faults

Some of the more common faults are well worth closer study by the supervisory grades, as well as the journeymen electricians and apprentices. These are given below, together with actual photographs taken of installations and examples of practices that have come to the author's notice during the course of the examinations made by the Council's inspecting engineers.

Regulation 107—Position of single-pole switches, fuses or thermostats. Where the single-phase two-wire supply to an installation has one pole permanently connected to earth, it is essential to ensure that all switches, fuses and thermostats are fitted in the phase or "live" conductor only.

In some parts of the country there is a tendency to use double-pole fusegear on such a system of supply, with the consequent danger that, should the neutral fuse "blow" under any conditions and the fuse in the phase conductor remain intact, there is a serious danger of the consumer receiving a severe or even fatal shock if he were to handle an appliance, such as a fire, under the mistaken impression that the circuit was "dead." It must be borne in mind that there have been fatal accidents where double-pole fusegear has been used, very often because it happened to be in stock and readily available.



Figs. 2, 3, 4 (l to r). Examples of inadequate enclosure of conductors and cable terminations

Regulation 108—Relative ratings of conductor and protective device. Proper protection against excess current is essential. Very often it is found that the correct size of fuse element has not been fitted, with the result that the appliance or the wiring, or both, may be seriously damaged under fault conditions. This trouble occurs most frequently where the manufacturers have fitted the fuse elements to the fuse carriers before they were sent out from their works.

Since the fitting of fuse elements is usually the job entrusted to the apprentice, the importance of proper instruction on this point cannot be too strongly emphasized.

Regulation 112—Final sub-circuits: general requirements. Both sub-clauses (A) and (B), together with Notes 1 and 2, are well worth careful study so that they are thoroughly understood.

Quite often it is found that a "common neutral" has been used for supplying more than one single-phase two-wire circuit. Not only must a separate neutral conductor be provided for each single-phase two-wire circuit or final sub-circuit, but it is also required that the appropriate neutral conductor can easily be identified with its phase conductor at the control or fuse distribution board position. Figure 1 is an illustration of indiscriminate bunching of neutral conductors at a fuse distribution board. To carry out any tests of the final sub-circuit wiring from this fuseboard would require the disconnection and checking of all neutral conductors that have been bunched under the two terminal blocks. Neutral busbars are so readily available that there is no excuse for not complying with this Regulation.

Regulation 207—Cable terminations. Although the whole of this Regulation is important, there are certain sections of it which appear to require additional emphasis, particularly where practical instruction is being given.

Under 207(A), attention is drawn to the necessity of securely anchoring *all* the wires of the multi-strand conductor.

Although thermoplastic cables are in common use, there is still a considerable use of taped and braided cables, usually of the vulcanised rubber insulated type. Reference to 207C will emphasize that the cutting back of any covering tape or braiding for at least half an inch from the end of the insulation is most important, if the insulation resistance tests on the cables are to be preserved throughout their useful period of life.

Probably the most consistent and widespread of any of the common faults is the inadequate enclosure of conductors and cable terminations as required by Regulation 207G. This Regulation requires:

Fig. 5. Cable cores left exposed and unprotected in roof void, in installation carried out in light gauge conduit

> "Cores of sheathed cables from which the sheath has been removed and non-sheathed cables at the termination of conduit or duct or trunking shall be enclosed. The enclosure shall be of incombustible material and may be a box complying with BS 816 or other appropriate British Standard, or an accessory or lighting fitting. Alternatively it may be formed by part of an accessory or lighting fitting and the building structure. In a damp situation the enclosure shall be damp- and dust-proof and corrosion-resistant."

In a conduit installation this requirement presents few difficulties, as it is normal practice to terminate with a suitable box or enclosure at all lighting points, switches, switch sockets, socket outlets, etc. Thus the complete final sub-circuit wiring from the distribution board to each and every outlet connected to that circuit is totally enclosed with incombustible material.

It is the installation using t.r.s. or p.v.c.-sheathed cables that suffers mainly from the neglect of these requirements, and Figs. 2 and 3 show typical examples at lighting point positions whilst Fig. 4 shows a bad example of this fault at a connecting box in a roof void.

Most of the manufacturers of accessories have gone a long way to ease this problem, by making available to the installation contractor suitable pattresses to fit all types of surface mounted accessories, such as ceiling roses, batten holders, ceiling switches and socket outlets. It remains now for proper instruction to be given to the contractor's staff in the correct use of these pattresses on the job. It is essential to ensure that the sheath of the cable is taken right into the enclosure of the pattress before it is stripped off the cable core. Quite often the whole purpose of the pattress has been defeated by the man on the job stripping back the cable sheath six

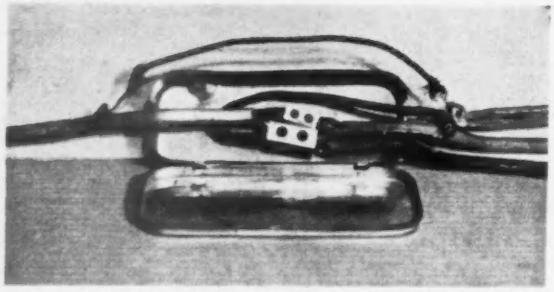


Fig. 6. Tobacco tin employed as a junction box. Note attempt at "jumper" between joined cables

inches or more and poking the surplus slack of the cable cores back into the hole in the ceiling, cavity partition or skirting board as shown in Figs. 2 and 3. It has even been reported that the complete back of the pattress has been knocked out, thus making it nothing more than a "break joint" ring instead of providing the complete enclosure required by this Regulation.

Fig. 5 illustrates an example of the same fault occurring on a domestic installation using light gauge or closed joint conduit, where the cables cores have been left exposed and unprotected in the roof void.

Another point which must be mentioned under Regulation 207G is that the requirement for total enclosure applies equally to the control equipment and consumer's control unit feeding the installation. Where backless type units are used and the unit is mounted on softwood or other combustible material, then it must be fitted with an incombustible backing sheet. These are readily available from the suppliers of the control unit.

Regulation 208—Joints in cables. The wiring systems most commonly used for domestic premises are usually of the sheathed type, requiring the use of connecting boxes. Apart from ensuring that these connecting boxes totally enclose the cables as required under Regulation 207G above, the boxes must be positioned in roof voids and under floors where they are at all times readily accessible.

The connecting boxes must also be appropriate for the job and no "make do" methods employed such as are illustrated in Fig. 6. This will be seen to employ a tobacco tin and, although two of the cables are not bonded to earth, some attempt has been made to put an inadequate "jumper" connection across two of the incoming cables.

(To be concluded)

EUROPEAN SUPPLY REVIEW

DEVELOPMENTS in Europe's electric power supply industry from the end of the war up to 1956 are reviewed at length in a new publication* of the United Nations Economic Commission for Europe. The review is divided into four main sections: consumption of electric power, electric power production, equipment, and international transfers and exchanges. Although it takes its story only up to the end of 1956, the comprehensiveness of its view makes it a valuable addition to literature. So far as most of its tables are concerned, it covers 27 European countries, and often adds comparative statistics in the USA.

A statistic of continuing interest is domestic consumption per head of population. The present report shows that in 1956 Norway headed the list of 2,162 kWh per annum for each inhabitant, followed by Iceland, Switzerland, Sweden and the UK in that order, the figure for the UK being 718 kWh, 2·57 times the European average. At the other end of the table the last four countries were Greece (69 kWh), Yugoslavia (61 kWh), Roumania (37 kWh) and Turkey (15 kWh) the USSR as a whole is noted at 128 kWh per inhabitant, 46% of the European average, while the average for the whole of the USA is put at 1,541 kWh (European average: 279 kWh).

It is suggested that analysis of post-war trends in consumption show two main elements in demand. The first varies with the general level of economic activity, as summed up by manufacturing output or other indices; the second reflects spread of electrification, including application of electricity to new uses. There is a suggestion that rate growth of consumption of electricity will slow down when electric power becomes about 80% of all commercial energy sources. Various formulae are suggested to take account of this situation, but it is remarked that such an effect is not yet imminent in such highly electrified countries as Norway, Canada and the USA.

The termination date for the present survey naturally affects the section on equipment particularly strongly. Experience up to 1956 foreshadowed many trends which have become established in more recent years, and these are discussed. At the end of 1956, the Continent's maximum output capacity of thermal generating plant was at 116,000 MW, up to 160% of the January, 1952, level; that in turn had been 149% of the January, 1947, figure. Hydro generating capacity was 53,000 MW, 159% of the January, 1952, level, which in turn was 140% of the January, 1947, level.

A development in which the UN Economic Commission for Europe has been particularly active has been international transfers of electric power. By the end of the period reviewed, the situation was that in Central and Eastern Europe many possibilities for worthwhile energy transfers had not been fully exploited, while in Western Europe where interconnections were of long standing, the growth in transfer possibilities had led to a need for strengthening main transmission interconnections.

Despite much interest during the early post-war years of the idea of international grid system connecting all generating systems, as has evolved in most individual countries, studies soon showed that returns in improved working would not justify the heavy capital expenditure of a comprehensive supergrid built for a specific geographical area without regard to particular energy needs. For example, an investigation some while ago showed that the eight most closely interconnected countries of Europe, the average difference between some of each individual peak load and the simultaneous maximum demand amounted to only 1·4% of the total load, or 215 MW.

* "Developments in the Situation in Europe's Electric Power Supply Industry during the Post-war Period," published for the UN by HMSO, price 10s 6d.

Readers Views

Correspondents writing under pseudonyms are asked to submit their names and addresses in confidence to the Editor

Flex Colour Dangers

THE letter you published from Mr R. B. Giles, in your issue of 28 January, raises important issues apart from the question of colours of flexible cables.

With the relaxation of import controls considerable quantities of domestic and other equipment are being freely imported into this country without the necessity of being subjected to approval or test. No doubt many reputable importers assure themselves that the goods are intrinsically safe and suitable for sale to the public in this country, but it is clear from Mr Giles' letter that some do not. Similar considerations apply to industrial equipment where in many cases clearances are not to British Standards, thus placing the British manufacturers at a disadvantage.

It is well known that many countries overseas will not permit any electrical equipment to be installed until it has been approved or tested by a Government or State body, with the payment of substantial fees. Whilst one dislikes the thought of any more official bodies, it would seem that the setting up of an approvals board or proving house to which all imported electrical apparatus should be submitted before sale or installation in this country is much overdue.

We feel strongly that British manufacturers should have this measure of protection when competing with foreign imports apart from the obvious duty of safeguarding the public from goods made to different and often inferior standards.

J. M. Hollander, M.I.E.E.,
DIRECTOR, EMS ELECTRICAL PRODUCTS LTD.,
KENNILWORTH, WARWICKSHIRE.

A testing and approvals marking scheme for electrical appliances is in process of formation through BEAMA-EDA-BSI co-operation. The approvals mark scheme will be open to imported equipment; but submission to such tests will be voluntary.—ED.

Cooker Circuit Loading

I THINK that Mr J. K. Maynard (28 January) is overestimating the power of electrical consumption in the average suburban house of, say, around 1,000 sq ft or so, of floor area. Many of these houses have electrical equipment of total rating, between 11 and 20 kW, but I have never heard of service fuses being blown as a result of overloading. As the bulk of these houses are occupied by people with little or no electrical knowledge, this is unlikely to arise from intentional limitation of load to some specified maximum.

As it is not technical knowledge that is producing limitation of load in these houses, obviously some other factor is operating. This factor is normal diversity of load.

I fancy that Mr Maynard is falling into the error of assuming that because his cooker is rated at 6 kW it is, in fact, using 6 kW. Practical considerations regarding cooking render it unlikely that the cooker circuit will ever be called upon to supply 6 kW. For domestic premises the IEE regulations for a fixed cooker circuit give the rating as 100% full load up to 10 amps and 50% of any load in access of 10 amps. At 240 volts this gives 2,400+ 1,800 watts or 4·2 kW as the cooker load.

I have cooked breakfast for as many as a dozen people, the meal comprising of porridge, eggs, bacon and toast, and never had occasion to use more that the grill-boiler and one ring. Multiplication of appliances on a cooker are merely a convenience and do not necessarily mean increased load.

In many modern houses cooking is done in the room in which the meal is consumed. For reasons of comfort it is unlikely that the cooker and space heater in such a room would be used together.

In asking for a 100 amp service I feel that Mr Maynard has overlooked another point when considering the average house. The whole of the electrical energy taken by domestic equipment, be it cooker, lights, iron, vacuum cleaner, radio, television, with the one exception of the water heater, where part trickles away with the dirty water down the drain, can be considered as heat input to the building. An average house having a floor area of 1,000 sq ft, and a room height of 9 ft has a volume of 9,000 cu ft. The normal allowance on heating equipment is 1½ watts per cu ft. On this basis the average house will have an heat requirement of 9,000 by 1½ or 13,500 watts. A 60 amp service will supply 14,400 watts. The electrical demand of the average house would, therefore, seem to be within the capacity of the present 60 amp service, even if whole house heating is required. Most people are, however, unable to afford this.

Except in special circumstances, such as extra large houses, there is little point in increasing the size of the services.

A. R. Gascoigne,
LONDON, N.15.

* * *

I WOULD like to reply to Mr Gascoigne's remarks. I did not raise the matter of 12 kW cookers, in fact I have never seen one, all I was trying to point out was that if a 60 amp cable and control unit are considered necessary with a 12 kW cooker then you are assuming that 60 amp will be taken and you will then be fully loading your service fuses. The service cable will, I agree withstand a considerable overload for some time.

As to my breakfast I did not say I required 6 kW to cook it; the 6 kW were being dissipated by the cooker in order to heat the kitchen—why have a separate appliance for the job?

I will not argue with Mr Gascoigne's figure of 14 kW for 9,000 cu ft; but this is the value—a bit high even perhaps—required to overcome losses. To bring a cold room up to temperature fast the more kW you can pump in for the initial period the better.

J. K. Maynard,
CHARLTON, S.E.7

Adaptors on the Ring

THREE-WAY plug/socket adaptors, as shown in your issue of January 21, seem in danger of bringing the ring-circuit into disrepute. With only the 5 ampere outlet fused, it would be possible to impose a

total load on one 13 ampere socket-outlet of 31 amperes. Let this socket be connected to a "spur", then you have also a potential overload on a 7/·029 in. cable of over 50%, with no prospect, yet, of the main fuse blowing. Again, this socket may be the second (and last) connected to a spur, in which case, if the penultimate spur socket happened to be in use at the same time, the cable connecting this socket to the ring-circuit could be even more severely overloaded, the time factor depending of course, upon the over-load/fusing relation of the particular fuse element and type of fuse-holder employed.

I have always understood that one of the chief benefits to be expected from the ring-circuit concessions would be the disappearance of the multiplicity of adaptors and the resultant tangle of flexes and burning of over-loaded sockets and switches, but it is beginning already to look like a case of "As you were!"

It will probably be said that I have made out a purely hypothetical case and that such loading would be fantastic and practically impossible. Who, for instance, would connect up two 3 kW fires and an electric kettle in one room at the same time? I can only reply that I know of a case where this was done, in order to warm a room quickly during the very cold spell a few weeks ago. Not from an ordinary ring-circuit, however, but from one with ample current reserve for just such an emergency. May I point out, also, that the average householder does not concern himself whether his plugs are fitted with 3 or 13 amp fuses. The sockets (and adaptors) are undoubtedly there for use—and he will certainly use them.

R. St.C. Ison,
CHELTENHAM, GLOS.

Continental Sockets

I WISH to bring to the notice of all those intending to take a holiday in Germany with their families, a risk of danger. This was brought to me by several servicemen serving in Western Germany in married quarters.

All the socket-outlets are non-shuttered and if switched you can switch on without the plug top being placed in. It is possible to touch the live socket and also catch the earth twin-scraper fitted on these recessed outlets.

The servicemen here are worried about their children fiddling about the terminals of the outlets. I write this hoping you are able to do something about it.

"National Serviceman Electrician."

INAUGURATION AT C.E.R.N.

WORK at CERN, the European Organisation for Nuclear Research, Geneva station, took a significant step forward on Friday. The famous Danish physicist, Prof Niels Bohr, inaugurated the CERN 25,000 MeV proton-synchrotron, the world's largest particle accelerator and so opened the way to more co-operative research into the ultimate nature of matter.

The machine is a major design and construction achievement in its own right; indeed, "machine" seems almost a misnomer, for this electrical device is no less than 656 ft in diameter. The protons to be accelerated are produced from atoms of hydrogen gas by an ion source, and undergo acceleration in a linear accelerator up to an energy of 50 MeV, which involves a speed of about one-third that of light. They are then injected in 6 micro-second pulses into the machine proper, a vacuum chamber 2,060 ft in circumference, of 7 cm by 14 cm section.

The particles are accelerated around the vacuum chamber by 16 accelerating cavities, where r.f. pulses feed in power to step up the speed. The protons are kept in their orbit by 100 magnet units, each of which has to be manufactured to the closest limits. Some idea of the accuracy involved is given by the magnitudes associated with the accelerating process. Protons go round the vacuum chamber 480,000 times in their one second journey, and at the end are travelling at 99·94% of the speed of light, 186,000 miles/second. At this speed, the Einstein relatively effect is such that the protons have a mass 25 time that applying at rest.

The beam of 25 GeV particles (1GeV=1,000 MeV) is normally allowed to strike a target in the vacuum chamber. The fragments of nuclei disintegrated are then studied by photographic emulsion techniques and other methods. Much of the work is directed to discovering more about the increasing number of short-lived sub-atomic particles becoming recognised by physicists.

CERN already has in operation a smaller accelerator, a synchro-cyclotron of orthodox design, capable of accelerating protons to 600 MeV energies.

CERN Purpose

With such equipment now available, CERN is likely to become a centre of important discoveries about the ultimate nature of matter; so some account of its organisation and purpose is timely. It was set up by an inter-Government convention that came into force in October 1954, because it was realised that the cost of equipment for the most advanced nuclear physics research meant that few, if any, European countries could afford to equip laboratories with the largest accelerators. This resulted in many first-class research workers drifting to the USA, where the necessary equipment was available.

Object of CERN is laid down as being collaboration in "nuclear research of a pure scientific and fundamental character"; specifically, CERN has no interest in military matters. Member countries are Austria, Belgium, Denmark, France, Federal Germany, Greece, Italy, Netherlands, Norway, Sweden, Switzerland, the UK and Yugoslavia.

So far the organisation has cost nearly £20 million, and the UK has been the largest contributor with 25%, France being the other major partner with 22% contribution. CERN is directed by a council of delegates from member states, and a director-general is in direct control of the staff. It is estimated that by the end of 1960, there will be nearly 1,000 physcists and engineers engaged at the CERN station at Geneva. Almost one-quarter of the senior staff are British.

What CERN is not—it is not part of the UN, OEEC or UNESCO; it is quite autonomous.

Progress in Rural Supply

EASTERN E.B. CHAIRMAN AT C.T.A.A. OPEN MEETING

AT the open meeting of the Chief Technical Assistant's Association, held in London last Thursday, the chairman of the Eastern Electricity Board, Mr H. V. Pugh, M.I.E.E., M.I.MECH.E., gave the address, taking as his subject "Electricity and the Rural Population." Using the Eastern Electricity Board's area as his example, he quoted figures to show the extent to which the board had brought the advantages of electric supply to farms and rural inhabitants in a particularly open area since it was created.

The EEB area comprises a population of some 5 million, distributed over 7,760 square miles, but 3¼ million are concentrated into about 14% of the area. Though this gives an average distribution of 190 people per square mile over the balance, very extensive sections have a distribution of as low as 0·2 persons per acre (120/sq mile) or less. Most of these are farm workers living in widely scattered hamlets or isolated dwellings. In April, 1948, when the board took over, there were 86,000 farms and one million other premises taking electricity; today there are 220,000 farms and 1¼ million other premises connected, leaving about 20% of the farms and 10% of other premises to deal with.

During this period there has been a considerable increase in material and labour costs which has resulted in the capital cost for connecting a rural consumer today to be nearly three times that applying in 1939. While the board has an obligation under the Electricity Act to supply electricity to whoever may demand it, it also has a responsibility in seeing that this is done in such a way that it will not penalise existing consumers or imperil the overall financial position of the board.

Zonal Planning

In the past this aspect of planning has resulted in giving preference to schemes involving supply to 50 or 60 properties at the end of a rural line over a similar scheme of the same magnitude, giving supply to only 10 or 12 properties. The larger villages and hamlets having now been provided for, the board is left with the balance to deal with on the most economical basis possible. When preparing an extension today, the greatest efforts are made to include all of the potential consumers in the initial installation on a zonal plan for even the cost of labour in making subsequent additions to lines is a relevant factor.

It is said that everyone wants electricity, but no one wants the overhead lines. Overhead lines, though, are the only economic means of rural distribution and most of the objections can be avoided by securing the co-operation of landowners and others concerned in the preparation of the routes and negotiating wayleaves. These negotiations may even result in additional consumers or, at the least, more extended use of the supply by those for whom it is being erected.

The whole of the planning of rural development has always to be made with one eye on the eventual consumption or revenue in its relation to the capital involved. A survey shows that, while in these areas the average annual consumption today is around 7,750 units, more than 7% use less than 100 units. Against this some 2% have consumption in excess of 50,000 units with an occasional 100,000 or 150,000.

Apart from its obligation to provide electricity, the board must, therefore, also endeavour to promote the use of the supply once it has been provided and, in this aspect, it must be remembered that, while it has a monopoly of supplying current, there is by no means a monopoly in the uses to which it can be put. Gas, oil and coal for cooking and heating are all competitors in an area where it has been traditional for these fuels to be used for these purposes. In regard to storage of solid fuel, this is not a problem in rural areas. In many cases considerable stocks exist on the consumers' premises.

Distribution Systems

Mr Pugh then described, with slides, the manner in which outlying areas were supplied from the 11 kV overhead system. This usually took the form of tee-offs from the 11 kV overhead lines to single-phase pole transformers adjacent to isolated or small groups of houses or farms with overhead l.t. supplies to the buildings from these points. Transformers are of 5 to 15 kVA rating, usually protected on the h.t. side by fuses. Because of frequent interruptions on the line due to faults which clear themselves and to endeavour to preserve a better continuity of service, auto-reclose circuit breakers are now being tried out with promising results.

Among the most frequent causes of fault is the one caused by birds flying into the overhead lines and in the EEB area it is the swan which is the chief offender. In one district, where there had been nine or ten failures in rapid succession from this cause, the solution proved to be a rearrangement of the conductors from the normal triangular disposition into a horizontal line. Ice and snow were also offenders but, apart from the exceptionally fierce blizzard in 1958 when some areas were without electricity for 24 hours, most interruptions were dealt with promptly and normally were not in excess of an hour or so. In this aspect he paid tribute to the work of the board's linesmen who, particularly in the 1958 blizzard, performed almost superhuman achievements in getting supply back under the most unpleasant conditions.

There was no question that these interruptions were a factor in the reluctance of farms to depend upon electric supply for such forms of heating as chicken and pig brooders and the board was always aware of this. Much good missionary work was done by "the electricity men" in rural areas to whom local inhabitants looked as their advisers on all electrical matters regardless of whether they were meter readers, linesmen or members of the showroom staff.

In regard to the remainder who were still without supply, it was now a case of "scraping the barrel" for

there were still too many who were using supply for lighting, radio and TV only regardless of the amount of capital invested. It was also pertinent to remember that, of the eleven "new towns" which had been developed, five were in the EEB area. Each of these represented a very great capital expenditure for mains and substations and only two were just beginning to show a profitable return in current consumption.

Informal Discussion

In an hour's informal discussion after Mr Pugh's address a large number of interesting points were raised. In reply to a question as to whether the auto-reclose breakers were to supplement or replace Petersen coils, Mr Pugh replied that, with distribution systems becoming as complex as they were these days, the Petersen coil was getting beyond its limitations. Auto-reclose breakers would replace them in some cases and supplement them in others. On the subject of voltage variations on the ends of rural lines, while the board could not always ensure that it was within statutory limits they endeavoured to do so. The rural dweller had not, however, been quite so concerned with fluctuations on his lighting as the town dweller until TV arrived; in fact TV was now becoming something of a "policeman" on voltage variation in the thinly populated areas.

On the subject of lightning damage on overhead lines and the advantages of putting the cables underground, Mr Pugh mentioned a number of cases in which lightning striking overhead lines had travelled along to cause breakdown on sections of underground cable connecting two overhead runs.

Questioned on the attitude of farmers to breakdowns affecting their milking and what steps were being taken to deal with the problem, Mr. Pugh replied that dairy farming was not very extensive in the EEB area, most of it being more suitable for agricultural purposes. Where dairy farmers were using electric milking, the board had standby portable generators which could be connected to the milking shed lines in an emergency. Asked if these generators might not be the answer to requests for supply from farms or houses which were quite uneconomic to connect to the main, the reply was that this might be considered as a last resource but it was not contemplated for the moment. He agreed with one questioner that the cheapness of the small Petter sets was often a factor against the connection of a new rural consumer in circumstances warranting the payment by him of a large contribution to the capital cost of the connection.

Lightning, and Earth Wire Angles

I.E.E. DISCUSSES O.H. LINE PROTECTION

EFFECTIVE positioning of overhead earth wires as a protection against transmission line outages resulting from lightning was the subject of a paper read before the IEE last week.* In his paper the author, Dr J. H. Gridley has developed a theory for the shielding obtained with an earth wire in accordance with refined modern conceptions of lightning stroke behaviour.

Earlier theories tended to overlook an effect that is now fairly well recognised, that the lightning stroke consists of a downcoming leader which must be met by upward streamers from an earthed body, before it is possible for the main current to flow through the stroke. The paper describes a theoretical analysis of disturbances in the electric field system caused by the downcoming lightning leader stroke in relation to upward streamers produced on either phase or earth conductors of an o.h. line. As the tip of the leader channel approaches earth, the charge distributed along its length creates an electric field which intensifies as the distance to earth decreases. An overhead line and its earthing wire will be subject to intense voltage stress if they lie within this field.

The actual potential gradient adjacent to a conductor will depend on the capacitive charge bound on the conductor, and also on the charge in the leader stroke. The author suggests that the former is the more important cause of voltage gradient in the conductor vicinity. If, due to the configuration of the electric field, the bound charge on earth wire and a phase conductor are the same, it seems probable that, under conditions of critical stress, an upward leader is just as likely to occur from one as from the other. The bound charges will be equal if earth wire and phase conductor lie on the same equipotential. To ensure that streamers come preferentially from the earth conductor, it is therefore necessary to ensure that this lies on a higher equipotential than the phase conductor. Two factors may seem to influence this theory adversely, first, distortion of the electrostatic field by phase voltage on the conductor and second the extent to which charging current can flow equally from earth to earth wire and to the normally-insulated phase conductor.

The author suggests that both these factors can be neglected, because in the first case, the stress adjacent to the conductor produced by a leader stroke would induce a potential as high as 3×10^6 V on an isolated conductor, which is clearly far more than even the highest line voltage in use. Whether the charges bound by the voltage stress on the phase conductor and earth wire will be equal depends on the velocity of wave propagation along the conductor relative to that of the leader tip. It seems that the former is about 10^3 faster than the latter and therefore it is unlikely to produce unbalanced bound charges on earth wire and phase conductors. The theory is borne out by the fact that, if the charge flowing from earth to a phase conductor sufficient to maintain it at earth potential during the approach of a leader, was even within 10% of the required value, the residual voltage on the conductor after the stroke resulting from the unbalanced charge would be of the order of 600 kV. One would expect this effect to produce flashovers on 33 and 11 kV lines, but this certainly does not occur in practice.

Determining Earth Wire Position

If it is assumed that the leader stroke descends vertically, and the charges bound on earth wire and phase conductors can be calculated, an equipotential plot can be made of stress distribution in the vicinity of the

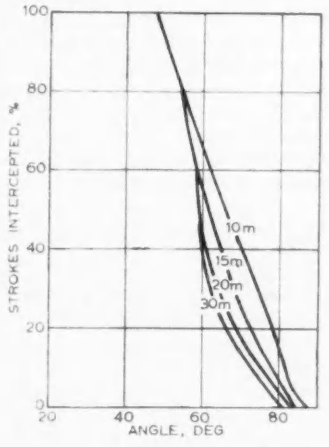
*Paper S.3172: "The shielding of overhead lines against lightning," by J. H. Gridley, PH.D., B.SC.(ENG.), A.M.I.E.E. Dr Gridley is head of the electrical engineering department, Regent St Polytechnic.

transmission line. This stres plot will show whether the earth wire lies on a higher equipotential than the phase conductors, and therefore whether it will afford protection by being the preferential source of an upward streamer. To make use of such plots, the minimum distance between a leader stroke and transmission line which is likely to result in it being struck must be known and the effective disposition of earth wire and conductor for different heights of leader tip must also be investigated. Both these factors are functions of the charge in the leader tip.

The procedure adopted is to plot equipotentials for a chosen leader charge at its appropriate distance from the line and earth and use the plot to determine the most effective position for an earth wire in relation to position of the phase conductor. These plots show that the angle made by a plane through earth wire and phase conductor, and the vertical determines the effectiveness of protection obtained. For an angle of 88°, i.e., the two wires in nearly the horizontal plane, protection afforded is zero, increasing to full protection for an angle of 48°. However the author states that these values are functions of our knowledge of stroke current peak values. The variation of minimum angle giving full protection with leader charge current varies from 48° for a current of 5 kA to 88° for a current of 160 kA. 5 kA is the lowest current which can be measured while 160 A is the highest current that has been measured in practice. This suggests that, provided the current does not fall much below 5 kA, an angle of 48° is satisfactory, but lower currents would require the earth wire almost vertically above the phase conductor to give full protection. There is a possibility that shielding failure would occur due to leader strokes approaching at an angle, but it seems likely that in the last and most vital stages of travel it will be vertical.

In practice, most earth wires have been installed to intercept strokes in a way which happens to accord with the theory, and it is therefore difficult to draw conclusions as to its effectiveness from available data. However, the author quotes the 220 kV Wallenpaupack-Siegfried line, where installation of an overhead earth wire at an angle making 44-47° to the most exposed conductor reduced flashovers at towers from 74 to 20 per 100 miles per year; and then improved earthing later reduced the rate to zero.

Although no earth wire can shield all phase conductors against direct strokes, the theory suggests that the fraction of strokes intercepted will vary from zero, when the wire is in the same horizontal plane as the conductor, to unity when it is vertically above the conductor and that the limiting angle for adequate shielding between a plane through phase and earth conductors to the vertical, is 45°.



Percentage of strokes against which protection is afforded plotted against earth wire/conductor angle

DISCUSSION

Dr J. S. Forrest (Central Electricity Research Laboratories) in opening the discussion, said any new additions to our knowledge of lightning behaviour and protection were to be welcomed. Lightning, even in this country with its relatively low storm incidence, was the greatest single cause of outages. He was a little disappointed to learn that the author's theory only confirmed the empirical angle of 45° which had been included in a BS several years ago. It would be difficult to justify the use of regular equipotential curves for many sections of line, for example in the vicinity of towers. Lightning behaviour on the 275 kV grid had not followed previous experience. Results obtained in the past suggested a decrease in the number of lightning strikes as the line voltage was raised; in fact, faults /100 route-miles/year on the 275 kV system had proved to be 1·6 instead of the figure of 0·5 estimated from mean fault rates of 3·8 and 1·0 recorded for the 33 and 132 kV systems, respectively.

Mr W. Casson (CEGB) said that in the forthcoming CIGRE conference an analysis of operating experience records on overhead lines above 225 kV would be published. Information related to 73, single- and double-circuit lines with shielding angles varying from 13·5° to 50° and isokeraunic levels between 5 and 50. He thought the author should have devoted more space to comparisons with known operating experience. Experience obtained indicated that earth wires were very effective in reducing faults, and performance improved as the angle was reduced below 45°. A single earth wire on a double-circuit line could reduce faults from 16 to 4 with an angle of 45°, and to 2 with a 30° angle. Auto-reclosing improved security of overhead lines, but an earth shielding wire was still necessary. It was proposed to carry out tests with an insulated tower having a spark gap connection to earth which, it was hoped, would enable surges as well as direct strokes to be recorded.

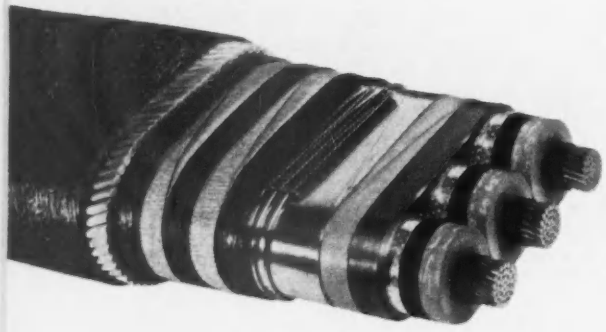
Mr D. F. Oakeshott (CERL) expressed the view that with a phenomenon as complex as lightning it was unlikely that a comprehensive theory could yet be established. He questioned a number of the author's assumptions, particularly that of a vertical leader stroke. The paper made no reference to field distortion produced by pilot streamers, and he was not convinced that the assumption of equal values of bound charge on conductor and earth wire was valid.

Mr G. B. Jackson (CEGB) commented on the difficulties of analysing accurately the effects of earth wires in service. It would be necessary to subdivide faults into various forms to show the efficiencies of earth wires at different angles. Such analysis is made more difficult by high speed reclosure practice. The only safe deduction at present was that effectiveness improved with lower screening angle. Tower screening was very important. The tops of our towers are relatively unscreened leaving the possibility of a direct stroke to tower structure and consequent backflash. Extremely good results had been obtained with a tower whose configuration enabled it to be effectively screened by the earth wire.

Dr R. H. Golde (ERA) complimented Dr Gridley on being the first to attempt an analytical approach. He agreed with the author that attempts to use model lines energised from impulse generators had proved unsatisfactory as a method of assessing line performance. He was doubtful of the author's statement that wave propagation velocity along the conductor was necessarily less than the leader stroke velocity in the final stages of its travel. He thought the practical aspects of the paper would have benefited by use of available data.

Mr R. A. Hoare (Merz and McLellan), Mr J. R. Smith and Mr L. Csuros (CEGB) also contributed to the discussion.

The author, in reply, said calculations showed that only the last 200 metres of the leader travel was relevant to the stress distribution and the assumption of a vertical stroke was justifiable. Any variation in the charges residing on earth wire and phase conductor were likely to be very small and could be taken into account in the field plot. He said that although 45° may be the empirical angle selected by the CEGB he was doubtful if it could be seen to apply on many existing angle towers.



Laying 170 kV cable

215 MVA SUBMARINE LINK FOR DANISH GRID

FLAT cables with the Mollerhoj construction have been in use for several years, sufficiently long, in fact, for considerable operational experience to have been gained with them. Altogether some 260 miles of this type of cable have been manufactured and, although only about 16% of this total has been used for submarine work, the complications and unusual features of such installations generally make them of considerable interest. Recently approximately 1¼ miles of this type of cable has been used to form a 170 kV sea link across the Kolding Fjord in Denmark linking the two power stations of Skærbæk and South Jutland. The installation was completed on 5 December, 1959, and will be brought into service this month. It will provide a 215 MVA link between the 150/170 grid sections now under construction in Jutland and Funen. The cable is noteworthy both for its size, its overall dimensions are approximately 4½ in. by 7 in., and because it is claimed to be the first three-core submarine cable in the world for so high a voltage.

Cable Type

Due to its suitability as a three-core submarine cable even at high voltages, the flat type of construction was chosen for this line. The cable is shown in the heading illustration.

Three 0·48 sq in. copper-braid-screened circular copper conductors, each insulated with a 0·51 in. thick paper wall, are laid together side by side in flat formation enclosed in a lead sheath. The lead sheath, which is 2·2 in. by 6 in. overall, is supported by a membrane reinforcement consisting of two layers of copper band applied circumferentially and two layers of corrugated bronze tape lashed with two copper wires to both flat surfaces of the cable.

The cable is armoured with 60, 0·204 in. galvanised steel wires. Anti-corrosion protection is provided between the membrane support and the submarine armour, and a jute protection is provided over the submarine armour.

The fully impregnated dielectric consists of graded paper insulation impregnated with low-viscosity oil. An increase of load in the cable and the temperature rise involved thereby will cause the oil to expand, such expansion being compensated for by an outward deflection of the flat sides of the cable which work as beams with uniformly distributed loads. The corrugated bronze tapes fitted on the flat sides ensure that the deflection is elastic. At no-load the cable resumes its original shape.

The self-compensating construction of the flat type cable has the following advantages:

1. There is no need for provision and maintenance of membranous tanks.

2. No longitudinal flow of oil takes place in the cable. Hence (a) no significant pressure changes are produced on short-circuit or open-circuit; and (b) it is possible to use an impregnating oil with a higher viscosity than in conventional oil-filled cables. The oil used permits simple freezing of cable ends next to joints with carbon dioxide snow, thus rendering possible thorough vacuum treatment and oil filling of the joints.

In spite of its three-core construction, the flat type cable is very convenient due to its high flexibility.

The cable for Kolding Fjord was manufactured in four lengths of about 1,640 ft each, and the processes used did no differ materially from those for conventional oil-filled cables. The four lengths of cable were transported to the harbour at Copenhagen after application of the submarine armour, and were there joined together by means of flexible junction boxes and subsequently wound on to a floating cable drum.

Cable Junction Boxes

The copper conductors were screwed and soldered together using junction ferrules of the same diameter as the conductors, and insulation was applied in the usual way. The joint is contained in a flat corrugated copper tube, which is sweated to the cable sheath. The sweated joints are protected from cracking by short flat copper rods fitted lengthwise and lashed with copper wire. The corrugated copper tube and adjoining cable ends are reinforced with heavy corrugated bronze tapes to prevent the flat sides of the copper tube causing membrane movement, while at the same time maintaining flexibility of the junction box.

The armouring is re-established, after the junction box has been provided with anti-corrosive protection, by letting the armouring wires from both cable ends overlap the box and fixing the overlappings with wire bindings. The junction boxes are then evacuated and filled with oil. During the process, oil in the adjoining cable ends is frozen with carbon dioxide snow.

Joining the four lengths of cable and winding onto the floating cable drum took about three weeks.

Floating Cable Drum

The floating drum was built by the Northern Cable and Wire Works in 1954 and has so far been in operation at five cable layings in Danish waters—the latest being the cable laid across the Kolding Fjord.

The drum is 19¼ ft in diameter and 35½ ft long, the cylindrical part being 32 ft long. Fully loaded, the drum will hold about 300 tons of cable. The discharging speed can be regulated by means of a brake system, enabling the pull on the cable and the slack required by the water depth to be kept under full control during laying operations.

Fig. 1 The pontoon used in conjunction with the large floating cable drum to bring the cable ends ashore and remove the supporting buoyancy barrels from the cable. Operations were controlled from the shore over a radio-telephone link

Cable-laying from a floating drum imparts a gentler treatment to the cable than does laying from coil on shipboard, because the cable will not be subjected to simultaneous torsional and bending strains, and also because the bending diameter will at no time be less than the diameter of the floating drum. A further advantage of the floating drum is its light draught enabling it to be operated close inshore, even in shallow waters.

However, laying by coiling has also been carried out with flat cables up to a length of 6¼ miles and in 328 ft water depth, and has not presented any difficulties.

Cable Route

The greatest water depth on the Kolding Fjord cable run was only about 45 ft, but an examination of the fjord bottom revealed that at the south coast the cable would be laid in a layer of mud up to 33 ft thick, and in the middle of the run the cable would lie in an even thicker mud layer. It was feared that the cable might sink into the mud and be suspended between two points; at worst, hanging by the southern end box, which is located right at the water's edge. It was, therefore, decided to lay the cable with a slack somewhat larger than normal practice requires. By laying the cable in four bights, each having a deflection of about 98 ft from the line of sight between the two shore points, it was possible to lay it with 5% surplus.

Laying

The laying was accomplished by close co-operation between the South Jutland Power Station, Em. Z. Svitzer's Salvage Co., and the Northern Cable and Wire Works.

The work was divided as follows: Em. Z. Svitzer's Salvage Co. provided the required vessels, empty oil barrels lashed together in pairs, winches, wire ropes, etc.; the South Jutland Power Station had previously erected beacons on both shores to indicate the cable route and also provided the necessary means of communication and the manpower required to haul the cable ashore; the Northern Cable and Wire Works were responsible for the correct and proper treatment of the cable.

The laying was carried out as shown diagrammatically in Fig. 2. The floating drum carrying the cable was towed to the laying point by Svitzer's 600 h.p. salvage vessel, the *Bien*—a voyage of about 175 miles, arriving at Kolding Fjord on 19 September. A 300-ton lighter, the *Frigga*, arrived the same day at the harbour of the Skærbæk Power Station with winches, wire, ropes, barrels, etc. Preparations were made to start laying the next day.

At 7 a.m., on 20 September, the floating drum was towed up as near as possible to the northern coast and stationed about 660 yd from the shore in the line of sight between beacons. At 8 a.m. the cable was hauled ashore by a 5-ton winch. A pair of oil barrels being placed under the cable at about 17 ft intervals as it was unwound from the floating drum. The cable end was carried by a pontoon provided with a pivotally mounted cable drum. This contrivance was subsequently used to convey oil barrels from shore to the floating drum (see Fig. 1). By 1 p.m., 660 yd cable had been laid on the fjord bottom.

Between 1 p.m. and 2.30 p.m., about ⅝ miles of cable was laid direct from the floating drum, which was towed by a 300 h.p. motor boat and held in place against the current by a 50 h.p. motor boat. The floating drum was able to go as near as about 550 yd to the southern shore. The remaining cable was laid on oil barrels parallel with the coast and then hauled ashore by two 3-ton winches. The laying operation was completed at 5 p.m. after the oil barrels had been removed.

Throughout the operation communication was maintained between the shore winches, floating drum, tug and pontoon with the cable drum by portable radio-telephone. Telephone connection was also established during the landing operation on the northern shore by a field cable between the floating drum and the landing winch. Accordingly, braking the floating drum, placing the

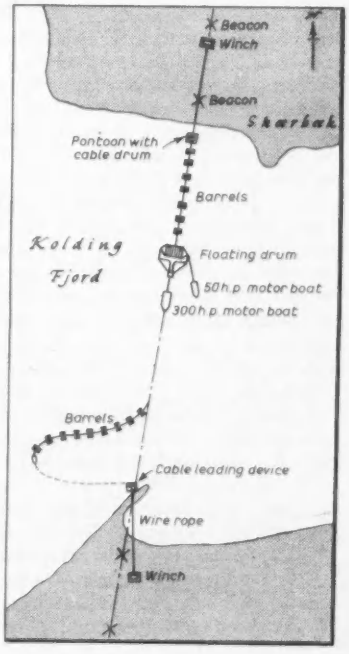


Fig. 2. The cable was payed out from a rotating drum drawn across the fjord by two motor boats. Kolding fjord is on the east coast of Jutland and separates the power stations at South Jutland and Skærbaek

barrels, and pull exerted by the winches were controlled from the floating drum. The whole cable was examined by a diver the day after laying. The cable was nowhere endangered by rocks, and no parts of it were freely suspended. The cable had already been buried in mud on part of the run where the bottom was softest.

Conclusions

The flat type cable has acquired a reputation for being particularly well suited for submarine lines on account of its self-compensating construction and because, by placing the three conductors side by side, it is possible to manufacture long lengths with high flexibility. This is borne out by the fact that the flat type has so far been used for 28 submarine cables representing a total length of cable of about 40 miles.

The procedure whereby the individually manufactured lengths are laid separately and spliced at sea has been employed in the case of one flat cable, the first of the 132 kV flat cables laid between Denmark and Sweden. The reason was to enable experience to be gained of jointing at sea with the possibility of later repairs in mind.

However, one of the following methods of laying is generally to be preferred:

A short flat-type cable can often be laid with advantage by floating it across the channel on empty barrels and afterwards removing the barrels. Small and light cables may alternatively be laid from a drum mounted in a barge.

Long flat-type cables can also be laid from coil on shipboard. This method has been used, for instance, for two lines of 3×0·54 sq in. 33 kV flat cables, one of which was 1¼ and the other 5¾ miles long.

For large and heavy flat-type cables a floating cable drum as used for Kolding Fjord is to be preferred.

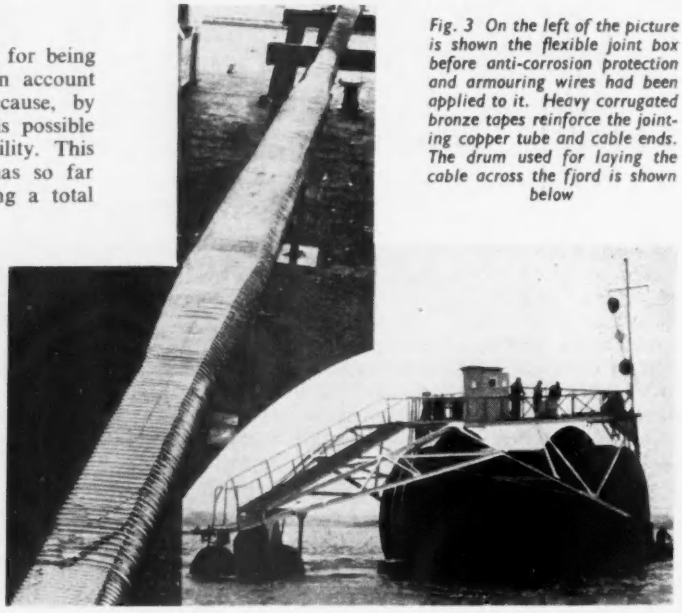


Fig. 3 On the left of the picture is shown the flexible joint box before anti-corrosion protection and armouring wires had been applied to it. Heavy corrugated bronze tapes reinforce the jointing copper tube and cable ends. The drum used for laying the cable across the fjord is shown below

Substation Earthing Safety

FAULT conditions in a.c. substations may result in a substation earthing grid rising to many thousands of volts above earth potential. This, in turn, is likely to give rise to severe voltage gradients between the hands of a man touching an earthed object and his feet, or even between his two feet while walking. Such dangerous conditions may result from the coincidence of several factors, for example, current density, earth resistivity and the resistance of the man's body. The analysis of these various factors is difficult and as a result, the problem of gradients has been somewhat neglected.

An attempt to devise an analytical approach simple enough for practical use was made by the AIEE as reported in 1958. This report has now been extensively revised and approved by the AIEE standard committee for publication under the title "Safety in a.c. substation grounding."

The approach used is to assume that tolerable current is just below the threshold of ventricular fibrillation of the heart. Fault clearing speed is important not only because speed of clearance reduces the length of the exposure time, but also because it reduces the probability of actual contact by a man. Tolerable voltages can be deduced depending on these factors and the problem resolves into designing the substation earth grid so that these voltages cannot be exceeded.

An equation has been developed which enables the length of earthing rods, neutrals and earthed sections of the substation structure to be calculated which will give a sufficiently low voltage gradient. If necessary, on the basis of this calculation, more earthing rods can be included in the substation earthing grid design.

If the check indicates that shock hazards still exist after further tests have been applied to the equation, the earth resistance may be decreased by increasing the ground area and earthing rods, applying chemical treatment and similar measures. Closer spacing of grid conductors may also be effective and it may even be advisable to provide alternative paths, for example through overhead lines. A major improvement can often be effected by using a high resistivity surface layer of suitable material, for example crushed rock, immediately below the operator's feet, thereby increasing the resistance in series with his body. It should be noted that although reducing ground resistance by wells, chemicals or additional earthing rods will transfer the maximum potential from a given part of the substation, it will not necessarily solve the gradient problem. There remains the limitation of short-circuit currents and prohibition of access to dangerous areas.

The methods have been evolved to avoid the two extremes of dangerous conditions and overdesign of earthing installations. Over simplification in this connection is a danger, but two major factors are the importance of prompt fault clearance and the recognition that low ground resistance is no guarantee of safety unless it is so low that it cannot raise the earth system potential beyond a value which the body can safely endure.

NOTES ON WIRING

BY MEGOHM

LIGHTING plays a big part in our lives and to engineers in the electrical industry it must be very disheartening to see the many bad examples of lighting which exist today. As I come off the platform of a main-line station in London each day, I have watched a new building being erected and my interest has increased recently because the electrical installation has become apparent.

The lighting fittings have been installed, and one morning recently they were alight. The fittings are of the fluorescent type, mounted close to the ceiling, but the effect is completely spoiled by the patches of shadow on the ceiling due to the irregular plaster-work. This is only one such case that I have seen recently, and I should think that the results must be very disappointing to the building planners.

Of course, this sort of thing is only one of the many building faults which affect the electrical installation. How often do we see the efforts of the electrician shattered by work carried out by plasterers? Switch-boxes, carefully positioned by the electrician, suddenly disappear behind an inch of plaster and then the business of packing the switch out begins. At times, too, the plasterer is responsible for filling up boxes and conduits with plaster, causing delay and expense to the electrical contractor. I have even known a nail to be driven through a conduit.

Why do these things happen? Is it because jobs are rushed along at a fast pace or is it that plastering and joinery work is often sub-contracted by the main contractor and, therefore, the sooner these tradesmen are finished the better the profit. This must inevitably lead to the neglect of all other work but their own by these sub-contractors. Of course, there are other mistakes which "happen," such as heating and water pipes being installed over the top of outlet boxes and other accessories, but it always seems to be the electrician who is at fault. His life at times can be an unhappy one.

Heating of Cables

No doubt the recent report on the possible heating of cables at lampholders and in fittings was of interest to electrical engineers and contractors. I wonder how many read it and decided to act on it? As stated in the report, it is now possible to use the new 100 W lamp where only a 60 W lamp was intended. The result is obvious and it is, unfortunately, in the home where this situation can occur most frequently. There must be many homes equipped with a 60 W size sphere in the bathroom and, with the smaller sized 100 W lamps for sale in most shops, there must be quite a few bathrooms with high temperature fittings by now.

It is, of course, a natural thing for the ordinary householder to do if the advertisements lead him to believe he can just replace 60 W with 100 W lamps. I can also see trouble arising from using this new lamp in a table fitting and the result might well be a fire due to the excess heat adjacent to the shade.

But, to return to the matter of the cables, I wonder if the associations connected with the contracting industry will do anything to help. I hope that they issue some form of information leaflet to their members pointing out the dangers and instructing them to take due notice. I doubt if the small contractor or the radio-type contractor will take much notice of such matters. They are more concerned with just getting the points to work, getting out and getting paid.

This matter of the cables heating in fittings is well known in bulkhead fittings, and here again I feel that the problem is not widely appreciated. Even with m.i.c.c. cables, precautions must be taken and the makers can advise on the best type of sheathing to be used in such cases. I hope that when a contractor comes across this problem he explains it to his customer in everyday language so that there is no mistaking the cure. Meanwhile, we engineers must watch points and do all we can to help.

Water Heater

My recent remarks about a water heater which I have installed in my kitchen was the cause of a slight argument the other day. I was discussing this heater and remarked that the loading was 3 kW and that I was operating it from the 13 amp socket-outlet incorporated in the cooker control unit. It was suggested that 3 kW is really too much for a 13 amp outlet and, anyhow, the heater was fixed to the wall and, therefore, was a "fixed appliance." The last statement is, of course, not strictly true because the heater can be lifted off the bracket quite easily. I admit there are anchoring screws which could prevent it being lifted off, but I don't think this is necessary.

A representative of a firm who makes electric fires stated that his firm had never manufactured appliances rated at 3 kW which could be served from a socket. They had always been of the opinion that portable fires, etc., should not be made larger than 2 kW. Perhaps he has a good point there and, of course, the added 3 kW on the cooker circuit might well cause trouble.

However, I have been keeping an eye open for possible danger on the cooker circuit in my own house and the only matter which worries me is the low voltage at the intake terminals *before* I start cooking. This may be due to low voltage in the network itself or the fact that two houses with practically the same load are served from one incoming cable.

Calorifier Rooms

I am pleased to note that hospital authorities are beginning to appreciate the use of m.i.c.c. cable in calorifier rooms and other "hot" rooms. Up to some months ago it was a difficult matter to persuade these people that it was so easy to get around the mass of pipes and equipment in these rooms with m.i.c.c. cables, that point being additional to the well-known virtues of such cables, of course.

I have found that such people are slow in getting round to such things that outside engineers have praised for some time. Is it because of the "higher-ups" who hear that these cables "cost more than ordinary types"? I think myself that it is because it takes so long for an idea to circulate and receive the official stamp to it.

OVERSEAS NEWS

from our correspondents abroad

CANADA

Columbia Talks Begin

Negotiations between Canada and the USA for the co-operative development of the Columbia River system water resources are to begin in Ottawa today, 11 Feb. A joint committee, under co-chairman Justice Minister Fulton and E. F. Bennett, Under-secretary of the US Department of the Interior, will launch the first in a series of diplomatic discussions that will lead to construction of one of the world's most ambitious power and flood control projects. It has been estimated that a system of power plants could be built to provide an annual output of over 16,000 MW. Of three preliminary plans studied by the IJC's engineering board, the scheme to divert the waters of the Kootenay River to the Columbia River at Copper Creek, about 12 miles south of the Columbia headwaters at Columbia Lake near the international boundary, was considered the most beneficial for development. The Kootenay diversion would involve construction of two dams, costing about $54,400,000. Key to the Copper Creek scheme is the Mica Creek storage dam 90 miles upstream from Revelstoke, a 740 ft high rockfill dam to hold back nearly 12,000,000 acre-ft of water, and to provide 1,392 MW. Estimated cost of the Mica Creek dam project is $314,800,000.

Brinco's Plan

A 120,000 h.p. hydro-electric plant is definitely to be built near Hamilton Falls, Labrador, by the British Newfoundland Corporation Ltd., the Premier of Newfoundland, Mr J. R. Smallwood, has announced. It is scheduled for completion in 1962. He revealed that the Iron Ore Co., of Canada, and the Wabush Iron Co. had agreed to purchase power from the project for use mainly in new iron mines. Site of the project is at Twin Falls, some 12 miles south of Hamilton Falls. It is estimated that a potential of 300,000 h.p. is available.

Winnipeg's Next

An immediate start will be made on a five-year, $140,000,000 power development at Grand Rapids, 250 miles north of Winnipeg, the provincial government announced recently in the throne speech. The Manitoba Hydro Electric Board will plan its work to have the plant generating 328,000 kW of electricity by 1964 if the electrical needs of the province require it. The new 358 MW power plant will be built at the point where the Saskatchewan River empties into Lake Winnipeg. It will be located on one of the new resource roads being pushed into northern Manitoba. At present, plants serving the southern Manitoba electric grid produce 725 MW, 560 MW from hydro plants on the Winnipeg River and 165 MW from thermal generation. By 1961 when the Selkirk steam plant and the new 168,750 kW Kelsey plant are in operation, generating capacity in the Province will be over 1 million kW.

Peace Plans Delayed

The revised plans of the Peace River Development Co. to put back the date of initial power production from 1966 to 1968, means that no major financing will be necessary for nearly two years. Mr W. C. Mainwaring, president, has made it clear that if the Government permits were forthcoming, the company had funds in hand to cover immediate expenses. It was hoped to be able to call up funds for the project only as they are required. The initial project, involving two dams providing 1 million h.p., will cost about $375 million. He also said this postponement of production was due entirely to the company's decision not to take export of power possibilities into consideration (although he considers such exports desirable). By 1968, the BC domestic consumption of electricity would be heavy enough to take up all of the Peace River's initial 1,000,000 h.p., but if the deadline was 1966 it would have to find another market until the BC demand caught up. He estimated that power could be offered from Peace River to Southern British Columbia around the six mills mark in 1968. Mr Mainwaring said financing of the project would be possible only if Peace River was given firm and irrevocable contracts to supply power to BC Electric and BC Hydro. If it had to share the market with power from the Columbia, the Peace River scheme would have to be shelved for years.

GREENLAND

Nuclear Power

An American proposal to build a 1,500 kW nuclear reactor in North Greenland this year has been approved by the Danish Government. The nuclear power plant will supply the living quarters, shops and a hospital at the United States' scientific base, "Camp Century," now being built some 100 miles inland, east of the coastal base at Thule. That location makes transportation of conventional fuels very expensive, and it is anticipated that the nuclear plant will thus prove more economical. The plant is to be built sectionally in the USA and assembled in Thule.

SWEDEN

Changed Site

Earlier proposals for an underground site for Sweden's first large nuclear power plant, the 100 MW project, have been rejected, and it has now been decided to build a surface station, according to the State Power Board. The plant is to be located at Björnö, on the Baltic coast east of the city of Norrköping. The design of the plant—using natural uranium as fuel and heavy water as moderator and coolant—will be entrusted to the Swedish Atomic Energy Co. in collaboration with the manufacturing companies ASEA and NOHAB. It is anticipated that site work will start in 1962 and the plant is planned to go into production in 1967. A previously discussed underground location for this project in Central Sweden will be reserved for a forthcoming larger nuclear power station, it is stated.

YUGOSLAVIA

Appliance Production

The production of electrical domestic appliances is being rapidly expanded in Yugoslavia, although a certain part of complete machines or parts of them are still being imported from western or eastern countries of Europe. The radio industry, which is now assembling 25 different types of wireless sets, started in 1959 with the assembling of home-made television sets, also. The manufacturing of cookers with infra-red heaters and automatic heat control recently started. The production plan for 1960 is aimed at 275,000 standard and 80,000 thermostatic electric irons, 32,000 small cookers, 60,000 grills, about 550,000 closed and open hotplates, 5,000 radiators, 10,000 bathroom water heaters, 25,000 washing machines, 40,000 absorption type and 25,000 compressor type refrigerators, 60,000 vacuum cleaners, 15,000 fans for the home and office use, 10,000 various smaller heaters and many

other electric apparatus for the home. Many of these machines are built under licence with numerous foreign enterprises. It is very characteristic that the factories, which are building the labour-saving appliances, are developing their workshops much quicker than the industry which is delivering basic material for the appliances. There is still a lack of fine copper sheets, thin wires and insulating material, which have to be imported from abroad, we understand.

BULGARIA

H.E. Project

Preliminary work has started on the construction of the Philipov Most hydro-electric scheme, one of the largest in Bulgaria, in the Rhodope mountains. It will consist of five dams constructed high up in the mountains, and seven power stations with a total capacity of over 440,000 kW. The main dam will be 144 metres high and over 400 metres long, and be of a new type, curved both horizontally and vertically. The new scheme will be twice as large as the Batak hydro-electric scheme, recently put in operation. It will supply over 1,000 million kWh a year, or about four times more than all the power stations in the country in 1939.

LIBYA

Tripoli Expansion

Plans for a new power station to be erected at Tripoli, Libya, are nearing fruition. Construction work has already started on the site, and it is expected that the 20 MW station will be in operation next year. But in view of the present rapid increase in the demand for power locally, it is anticipated that additional capacity will soon be required.

PAKISTAN

Fan Industry Protection

On the recommendation of the Tariff Commission, the Government of Pakistan have decided to grant protection to the electric fan industry for the period ending 1 Oct., 1962, it has been announced in Karachi. Some of the protection measures granted are: (1) The existing protective duty of 80% *ad valorem* general and 70% *ad valorem* preferential for UK on electric fans is to continue; (2) Rebate of customs duty on the following raw materials should be given in addition to the rebate given at present on other items: (a) aluminium sheet, (b) aluminium ingots, and (c) bush bearings; (3) The demand of the industry for the grant of licence for machinery should be considered favourably subject to availability of foreign exchange; (4) Sales tax on electric fans will continue to be levied at the present rate of 20% *ad valorem*. Exemption from sales tax in favour of establishments which have sales of less than Rs 36,000 a year is also to continue. In addition, the Director-General, Supply and Development, is to consult the trade to ascertain whether the existing specifications (based on BSS and ISS) for application to the Department's own contracts, are suitable for the export market. The Ministry of Industries is also to impress upon the electric fan industry the desirability of concentrating on capacitor type fans, and to encourage them to mass produce electric motors rather than make sufficient for their own requirements. The possibility of establishing new capacity for manufacture of electric fans in East Pakistan during the Second Five-Year Plan period is to be studied, along with a proposal for making air conditioners.

Warsak Date

The Warsak multi-purpose project is expected to be in operation by August next. The irrigation tunnel was completed last month. In the first phase the power station is designed for an installed capacity of 160 MW, but this can be later increased to 240 MW. The work has been carried out largely with the aid of the Canadian Government.

Village Electrification

With the realisation of the second Five-Year Plan all villages having population of one thousand and above will be electrified throughout West Pakistan. The West Pakistan Water and Power Development Authority has already approved a plan to electrify 300 villages in the Central Zone. The Authority also plans to sink 300 tube wells during the current year in the electrified area.

NEW ZEALAND

"No-break" Plant

Following the supply of nine "no-break" power plants to the New Zealand Government for installation in airports throughout New Zealand, Pelapone Ltd. have received a further contract from the New Zealand Post Office authorities for their "no-break" generating plants and control gear. This equipment is destined for installation at Auckland, Hamilton, Palmerston North and Wellington co-axial terminal stations to link up with 14 repeater stations over the Auckland to Wellington trunk telephone system.

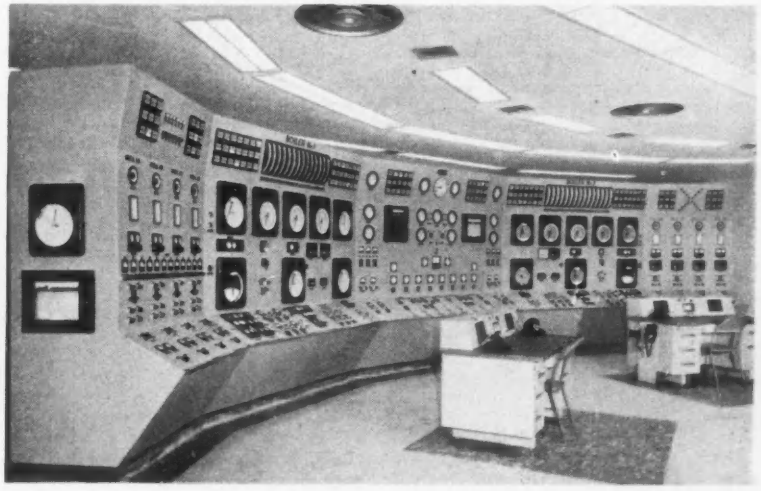
JAPAN

Remote Control

Remote control of hydro-electric plants has been adopted by Japan's Electric Power Resources Development Co. and two stations have already been converted to such operation, thereby reducing maintenance staffs. They plan to take the idea a step further by utilising closed-circuit television, which would enable them to exercise complete control of such stations.

Higher Line Voltages

The Kansai Electric Power Co. Inc. is planning to build a 400 kV overhead power cable by November, 1963. This follows closely upon the news that the Sumitomo Electric Industries Ltd. have been successful in the experimental production of a 500 kV cable. The new 400 kV cable is for the proposed Hokuriku trunk line scheduled for initial operation in 1963 at 275 kV, but all preparations will be made for it to operate at the higher voltage when required. Construction work on this line is to start in April, 1961.



The control panels for Nos. 1 and 2 boilers at the new Boundary Dam generating station at Estevan, Saskatchewan, which was put into operation last year by the Saskatchewan Power Corporation. The second 66 MW generating set is expected to be in operation early this year. Ultimate capacity of the plant is at present listed at 264 MW. The Boundary Dam station was designed to make further use of the vast supplies of lignite coal, underlying the Estevan area. A special feature of the plant is the fact that to ensure adequate supplies of cooling water a dam had to be constructed across Long Creek near the station site

Personalities *in the industry*

Mr T. C. Johnston

Mr R. C. Kember

Mr J. W. Bessant

Mr D. F. Ireland

Mr P. A. Bates

Formerly general manager of Metropolitan Electric Cable and Construction Co. Ltd., **Mr T. C. Johnston** has joined British Insulated Callenders' Cables Ltd. as regional manager (Eastern Region). Mr Johnston, who was educated at Shrewsbury School and Northampton Polytechnic, joined Callender's Cables and Construction Co. Ltd. in 1937. Two years later he transferred to Metropolitan Electric Cable and Construction Co. Ltd. as sales manager. He held this position, except for intervening war service from 1940 to 1945, until 1958 when he was appointed general manager. He was a director of that company from 1956 until the beginning of this year when their activities were merged with those of BICC.

The President of the Board of Trade has appointed **Mr T. G. Coughtrie,** C.B.E., J.P., LL.D., chairman and managing director of the Belmos Co. Ltd. and **Mr W. L. Mather,** O.B.E., M.C., T.D., M.A., a director of Mather and Platt Ltd., as members of the Council of Industrial Design. **Mr Duncan M. Oppenheim** is the new chairman of that Council, succeeding **Sir Walter Worboys** who has resigned after being chairman since 1953.

Formerly director-general of the BBC, **Sir Ian Jacob** has joined the board of Electric and Musical Industries Ltd.

Part-time members of Electricity Boards who have just been reappointed by the Minister of Power are: **Mr W. H. Lawson,** C.B.E., and **Lt-Col E. L. Luce,** D.S.O. (Southern); **Mr C. H. B. Wilson,** C.B.E. (East Midlands); **Mr R. E. Crowe** (Yorkshire); and **Mr E. J. Smith** (North Western).

In view of the fact that it has been found desirable to treat Eire as an export territory, **Mr J. F. O'Mahony** has ceased direct employment by the Benjamin Electric Ltd. and has taken up a position as sales manager of the General Electric Co. of Ireland Ltd. The latter concern, along with AEI and Nugent and Cooper Ltd., are distributors of Benjamin equipment in Eire.

Atlas Lighting Ltd. announce that their Technical Sales Department, under the control of Dr H. H. Ballin, director and technical sales manager, has been reorganised to consist of four new sections handling lighting fittings, commercial engineering, lighting engineering and product engineering. **Mr R. C. Kember,** B.SC. HONS. (ENG.), A.M.I.E.E., is manager of the Fittings Department responsible for the design and technical co-ordination between production and sales of lighting fittings, accessories and control gear. **Mr J. W. Bessant,** formerly Atlas lighting engineer in Leeds, moves to Thorn House to manage the Commercial Engineering Department which will be responsible for the development of lighting through architects, consultants and large users. **Mr E. Harrison-Jones,** previously in control of the London Illuminating Engineering Department, takes over control of the lighting engineers' activities on a national basis. The fourth group, the Product Engineering Department, will be controlled directly by Dr Ballin, with **Mr G. V. McNeill** responsible for the development and technical liaison with laboratories and factories for fluorescent tubes and control gear; **Mr J. Stewart** for tungsten lamps and fittings, and **Mr G. E. Collender** for discharge lamps and gear.

Mr R. Cutler, works accountant at the Bedford factory of Brookhirst Igranic, has been given the additional appointment of chief cost and works accountant of the company.

The BBC announces the appointment of **Mr C. J. Dolan,** A.M.I.E.E., as engineer-in-charge, television, Belfast. Mr Dolan joined the Corporation in 1932 as an assistant maintenance engineer in the London control room. Towards the end of the same year he was appointed to Glasgow, where he became maintenance engineer in 1936 and senior maintenance engineer in 1941. In 1952 Mr Dolan transferred to the Scottish Television Unit in Glasgow and became a senior television engineer later that year, which post he has held until taking up his new duties on 1 Feb.

A new sales division has been formed by Electrolux Ltd. to cover the South Wales area, with division offices at 60 Newport Rd, Cardiff. Manager of the new division is **Mr David F. Ireland,** formerly deputy divisional manager of Electrolux Ltd.'s Western Division. His deputy divisional manager is **Mr Percy A. Bates,** formerly an area manager in the company's Western Division. Mr Ireland, who is aged 41, joined Electrolux in 1953 as an area manager in its Western Division and was promoted a deputy divisional manager in 1956. Before joining the company he was a metallurgical chemist in the steel industry. Mr Bates, who joined Electrolux as an area manager in its Western Division in 1954, began his career in the electricity department of Southend-on-Sea Corporation and joined Gravesend Corporation's electricity department in 1939. After six years' war service in the Royal Artillery he was with the South Eastern Electricity Board for eight years as a commercial assistant. The area managers in the new division are **Mr W. J. Cummings, Mr F. M. Davis, Mr W. D. Drew** and **Mr D. J. C. Gregory.**

Newly appointed export sales office manager of the English Electric Co.'s Domestic Appliance Division is **Mr William A. Weaver,** who will be responsible to sales manager, Mr A. Mackenzie Parkinson. Swansea-born Mr Weaver, who joins English Electric with considerable experience in the engineering and consumer goods export markets, speaks French, Italian, German, Spanish and Russian. He succeeds **Mr C. F. Bircher,** who is now concentrating on the merchandising programme of the company's home laundry equipment.

The Eastern Electricity Board have appointed **Mr K. E. Lingley,** GRAD.I.E.E., to be third assistant engineer (tariffs and economics section) in the commercial department at Wherstead. He replaces **Mr D. T. Hoare** who has accepted an appointment outside the industry. Mr Lingley served his apprenticeship with the Ipswich Corporation Electric Supply Department, obtaining his technical education at the Ipswich school of technology where he gained higher national certificates in mechanical and electrical engineering. After his apprenticeship he was appointed a junior installation engineer with the corporation and subsequently became a district commercial assistant with Ipswich district of the Eastern Board. In 1952 Mr Lingley was appointed a third assistant engineer at the Suffolk sub-area headquarters. He is a part-time lecturer at the Ipswich School of Technology.

From the Simplex Electric Co. Ltd. we learn of the following appointments in their sales organisation, effective from 1 Feb.: **Mr A. Hosken,** former Midlands area manager, is now manager (distribution), responsible for the administration of all the company's branches. He is replaced as Midlands area manager by **Mr A. W. Strickland,** who was previously export manager (Simplex Division). The latter position is now taken over by **Mr R. A. Wootten,** and **Mr R. C. Bannister** has been appointed commercial manager (administration) responsible for the head office Sales Departments which are now all located at Blythe Bridge. **Mr F. W. Bell** becomes south west area manager, located at Bristol and responsible for the territories covered by Bristol, Cardiff and Plymouth branches. **Mr R. F. Arnold** remains the southern area manager continuing to be located at Southampton and responsible for the Southampton, Reading and Brighton territories. Mr Bell has been replaced as north west area manager by **Mr K. R. H. Glass,** who will in future be resident in Manchester. **Mr H. Q. Mann** has been appointed branch manager at Manchester. **Mr A. D. Monk** has been transferred from Manchester to be manager of the company's new premises in Leicester, and **Mr R. M. Caffelle,** formerly Leicester branch manager, has been appointed Creda sales engineer (Midlands area). Previously manager of Sheffield branch, **Mr D. England,** has been appointed manager at Leeds, and **Mr A. H. McGee,** formerly branch administrative officer at Glasgow, has been appointed to a similar position at Sheffield. **Mr D. Smith** is now assistant export manager (Simplex Division) with **Mr A. N. Hall** as assistant export manager (Creda Division).

Lord Chandos, chairman of AEI returned last week from his 3½-week tour of India. The Society of Chemical Industry have awarded their 1960 Messel Medal to him for meritorious distinction in science and industry.

Mr D. Musk and **Mr W. Thorn** have recently joined the outside sales organisation of the International Rectifier Co. Ltd. Mr Musk will be resident in Leeds and is responsible for the customer liaison in the counties of Yorkshire, Durham, Northumberland, Lancashire, Derbyshire, Cheshire, Cumberland, Westmorland, North Wales and Northern Ireland. Until recently he was associated with the Semiconductor Division of Ferranti Ltd. and, earlier, was with Standard Telephones and Cables Ltd. at Harlow. Mr Thorn is responsible for the customer liaison in the counties of Norfolk, Suffolk, Bedfordshire, Hertfordshire, Essex, Cambridgeshire, Huntingdonshire and Buckinghamshire. He was previously engaged in the design of rectifier equipments with Standard Telephones and Cables Ltd. at Harlow.

Two members of the East Midlands Electricity Board have won the accountancy examination prizes awarded by the Institute of Municipal Treasurers and Accountants from a central fund established jointly by the former CEA and the South of Scotland Electricity Board. **Mr J. M. Marriott,** of the accountant's department of the Nottingham sub-area won the Intermediate Examination prize, and the Final Examination prize is awarded to **Mr R. Simpson,** in the Accountant's Department of the Mansfield and North Notts sub-area.

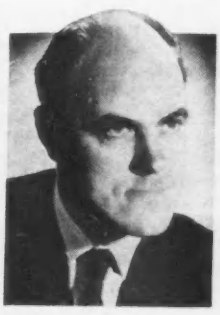
Mr O. T. Evans, ASSOC.M.C.T., A.M.I.MECH.E., M.I.E.E., has been appointed manager of the new Plant Applications Engineering Department of AEI Heavy Plant Division, with headquarters at Rugby. Deputy manager of the department is **Mr W. Spence,** B.SC., M.I.E.E., A.M.I.MECH.E. Mr Evans received his technical education at the Treforest School of Mines, Cardiff Technical College, and the Manchester College of Technology. After gaining early experience with Baldwins Colliery Ltd. he went to M-V at Trafford Park as a school apprentice in 1943. On completing the course, he spent a year as a mining trainee, afterwards joining the Mining Division of General Engineering Department. From 1953 he was responsible for mining development projects, and in August, 1956, was appointed assistant chief engineer (mining), Electrical General Engineering Department, being promoted chief engineer of that department in July, 1957. Following upon the reorganisation of AEI the title was changed to manager, Plant Applications Engineering Department (Manchester). Mr Spence was educated in Scotland, first at Kirkcaldy High School and afterwards at the University of Edinburgh. He joined BTH as a student apprentice in 1937, having previously spent two periods with the company as a vacation apprentice. During the war he was commissioned in December, 1940, and subsequently appointed instructor in AA fire control (radar) in 1941. Later, as Captain in REME, he was lecturer in electrical engineering and fire control instruments at the Military College of Science from 1943 to 1946. Mr Spence rejoined BTH as a member of the industrial engineering staff, working on rolling mill schemes and studying amplidyne applications in industry. In 1947 he was awarded a BTH Fellowship which enabled him to spend a year in the USA with the General Electric, where he worked on high-speed tandem cold strip mills and electronic sectional paper-machine drives. He rejoined Industrial Engineering Department in November, 1948, and was appointed Section Leader of the Electrical Development Section. He became assistant manager of the Department three years later and manager on 1 Jan., 1957.

Assisting the manager of this new AEI Plant Applications Engineering Department are four engineers-in-charge, each of whom controls the activities in a specialised field. These are **Mr L. Abram** (mining), **Mr P. E. Peck** (metal industries), **Mr J. McTaggart** (regulating systems and general projects), and **Mr H. Williams** (control equipments). Mr

Mr A. Hosken

Mr R. F. Arnold

Mr K. E. Lingley



Mr O. T. Evans

Mr W. Spence

Mr I. H. Leitch

Mr J. N. M. Legate

Mr C. T. Scarf

Peck and Mr Williams are located at Rugby. Mr Abram and Mr McTaggart, being located at Manchester away from the headquarters of the department, have also the title of assistant manager on account of administrative duties.

Mr I. H. Leitch has been appointed to the board of Bowthorpe Electric Co. Ltd., as sales director. He joined that company in January, 1958, as sales manager.

Appointed manager of the Control Gear Engineering Department (Manchester) of AEI Motor and Control Gear Division is **Mr J. N. M. Legate,** B.SC., A.M.I.E.E. In that Division **Mr C. T. Scarf** has been nominated chief control gear development engineer. Mr Legate received his technical education at the Imperial College of Science and Technology and the City and Guilds (Engineering) College, and after gaining his B.Sc. degree at London University, joined the Metropolitan-Vickers Electrical Co. in 1931 as a student apprentice. On completing the course, he joined Industrial Control Sales Department as a junior engineer. From 1947, Mr Legate specialised in electronic control and during the period 1953 to 1955 assisted the sales manager, Industrial Control Department. In 1955 he became assistant chief engineer, Industrial Control Department, which position he held until his present appointment. Mr Scarf gained technical training at Birmingham Central Technical School and Manchester College of Technology, and joined Metropolitan-Vickers Electrical Co. in Industrial Control Department, first as a draughtsman and then as an engineer. In 1928 he left M-V to become chief engineer, Industrial Control Department, English Electric Co. and was responsible for developing a complete line of control

THREE I.E.E. AWARDS

THE Council of the Institution of Electrical Engineers have elected to honorary membership **Col B. H. Leeson,** C.B.E., T.D., and **Dr Richard L. Hearn,** M.A.SC., D.ENG., and have awarded the Faraday Medal to **Sir George Thomson,** D.SC., F.R.S. Col Leeson is made an honorary member "in recognition of his extensive contributions to the application of electrical science and engineering in the manufacture of electrical plant and equipment, to the development of co-operative effort within the electrical industry and to the training of electrical engineers, and of the services he has rendered to the Institution over nearly half a century." The election of Dr Hearn is "for his notable contributions in the development of electricity generation and its supply for the benefit and use of mankind, particularly in Canada, and for the part he has played in international co-operation in this field."

Col. Leeson only recently retired as director of BEAMA. Earlier he had been with A. Reyrolle and Co. Ltd. since 1919, becoming joint manager in 1937, a director in 1938, director and general manager in 1940, and managing director in 1945. He was closely associated with the establishment of the first British short-circuit testing station in 1929, and with IEC concerning the standardisation of switchgear performance.

Dr Hearn was formerly chairman of the Hydro-Electric Power Commission of Ontario, and has been a frequent visitor to Britain. He is prominently remembered for his part in the task of utilising the Niagara Falls for power generation—that power station is named after him. He was with the Commission from 1918 to 1921 when he joined the Washington Water Power Co., but after three years there he became assistant chief engineer and secretary-treasurer to H. G. Acres and Co., consultants. After further periods with other consultants he rejoined the Commission in 1942 as executive assistant to the chairman. Subsequently he became general manager and chief engineer, and in 1935, chairman. Dr Hearn is a director of Atomic Energy of Canada Ltd. and of several other organisations.

Sir George Thomson, who receives the Faraday Medal, "in recognition of his outstanding contribution to the advancement of electrical science, of the leadership in research which he has given to others in this field, and of his inspiring services to education in science and technology," has been Master of Corpus Christi College, Cambridge, since 1952. He is a son of the late Sir J. J. Thomson, himself a famous physicist. It was while he was Professor of Natural Philosophy at Aberdeen University between 1922 and 1930 that Sir George started work on experiments in electron diffraction, the eventual results of which were to earn him (jointly with Davisson of the United States) the Nobel Prize for Physics in 1937. In 1930, Sir George was appointed Professor of Physics at the Imperial College of Science, a post he held for 22 years. He headed the first British Committee on Atomic Energy—from 1940-41—which reported that it was possible to make atomic bombs. When the fission of uranium by neutrons was discovered in 1939, Sir George was struck by its possibilities, and persuaded the Air Ministry to obtain a ton of uranium oxide for experiments. These were still incomplete at the outbreak of war, when he went to the Royal Aircraft Establishment to work on a number of problems, including magnetic mines. He held an important war-time post in Ottawa, and after the war he was scientific adviser to the British delegation to the UN Atomic Energy Commission in 1946. In 1952 Sir George returned to Cambridge as Master of his old college.

Col B. H. Leeson

Dr R. L. Hearn

Sir George Thomson

gear. Six years later, Mr Scarf rejoined M-V as assistant chief engineer, Industrial Control Department, but left the service of the company again in 1942, when he became chief engineer to De Renzi Holmes and Co., for whom he was, for three years, general manager. In 1951 he once more rejoined M-V as chief engineer, Industrial Control Department, in which position he has continued until his new appointment.

Mr T. White Wilson, a Director of Plessey International Ltd., is now on an extensive tour of the Union of South Africa, North and South Rhodesia to further the many Plessey interests in these areas.

Mr L. G. Avis, A.M.I.MECH.E., A.M.INST.F., has been promoted to manager of the London and Southern Region of John Thompson Water Tube Boilers Co. Ltd. He joined the John Thompson organisation in 1951 and, after spending three years in the service of a number of the group's companies, he joined the London office staff in 1954.

The John Thompson Conveyor Co. have appointed **Mr P. D. Hunter** as their London and Southern Area sales engineer, and as such, he will be responsible for all sales and services in Central London and the Home Counties. Mr Hunter thus assumes the duties which were previously the responsibility of **Mr J. M. Tudor,** who will now be situated at the company's head office in Ettingshall, Wolverhampton. Mr Hunter was earlier with Sovex Ltd., The New Conveyor Co. and, more recently, Mechandling Ltd.

In our reference to **Prof Misha Black** last week we should have stated that he has been appointed consultant *designer* to Claudgen Ltd.

Mr R. E. F. Sykes, A.M.INST.W.M., has been appointed general manager of Griffin and George (Laboratory Construction) Ltd. in succession to **Mr A. E. Lambert** who has retired.

Following the untimely death of Mr F. E. Lawrence, **Mr F. J. Robinson** has been appointed to succeed him as Head of the Exhibition and Display Section, Publicity Organisation of the General Electric Co. Mr Robinson joined the GEC in 1935 and after war service went into the Publicity Organisation where he has been working on exhibitions and display for the Company ever since, apart from a break from 1950 to 1953 when he was with the English Electric Co. He has been responsible, among others, for GEC exhibits in Copenhagen and Hanover.

General manager of Advance Components Ltd., **Mr E. G. Wakeling** has been elected a director of the company. He joined the firm in February, 1959, and was formerly manager of the Servo Division of Elliott Brothers (London) Ltd.

Mr K. B. Tolley has been appointed export manager for Hadley Telephone and Sound Systems Ltd.

After over 48 years' service in the cable industry, **Mr L. J. Ransom** retired from the Telegraph Construction and Maintenance Co. at the end of January. He received his early training with Johnson and Phillips Ltd. and served in the Royal Navy during the 1914-1918 war. During his career he has been associated with several of the principal companies in the electrical cable making industry. He served on several of the organising and technical committees during the war, and was a prominent member of the Joint Industrial Council for the Electrical Cable Making industry. In recent years he has been closely associated with overseas projects in Pakistan, Africa, Australia and Malaya for Telcon.

Mr Frank Haxell, general secretary of the Electrical Trades' Union, has been re-elected to that position for a further period of five years, it was announced last week-end. He received 19,611 votes, against the 18,577 cast for his opponent, **Mr J. T. Byrne,** who has been secretary of the union's South West Scotland area for many years. The union's membership totals 230,000. It is understood that the votes of about 100 of the union's 700 branches were disqualified by the scrutineers.

Mr G. Christy, B.SC.(ENG.), A.M.I.E.E., managing director of Christy Bros Ltd., was presented with a model control panel at the firm's social and dance held recently in Chelmsford. The miniature panel was made in the form of a circuit tester by members of the company's staff.

Mr Peter Balmford has been appointed commercial manager of Walter Balmford Ltd. and **Mr R. H. Varnom** has joined the company as sales manager. Mr Balmford was educated at Queen Mary's Grammar School, Walsall, and served in the RAF for three years in Air Traffic Control in the Far East as well as in this country. Mr Varnom was formerly sales manager with Donovan Electrical Co. for many years and has been associated with the electrical industry for over 34 years.

The Director-General of the International Atomic Energy Agency, **Mr Sterling Cole,** is now on a ten-day visit to India, at the invitation of the Government of India. He is accompanied by two deputy directors general, **Prof Hubert de Laboulaye,** who is in charge of the agency's technical operations, and **Prof Arkady Rylov,** who heads the department of training and technical information.

OBITUARY

Mr G. H. Johnstone, O.B.E., a part-time member of the South Western Electricity Board from 1948 to 1955, has died, aged 78. He was a well-known West Country horticulturist and farmer, and when he retired from membership, the Electricity Board founded the George Johnstone Lecture at Seale Hayne Agricultural College, Newton Abbot, in recognition of his services to both the electricity supply and agricultural industries over a long period.

Dr I. V. Kurchatov, director of Russia's Atomic Energy Institute, and the leading authority on nuclear energy in that country, died on 7 Feb., aged 58.

Mr J. Nelson, M.I.E.E., F.R.P.S., who died on 31 Jan., served with British Insulated Cables Ltd. from 1903 until 1929, apart from war service. Following a short period as a consultant he joined the Central Electricity Board upon its commencement and took part in the early development work of the 132 kV system in the Midlands. Upon his retirement in 1945 he was the transmission engineer in the Central England area. He renewed his association with BICC and remained with them in a local capacity for a further eight years. He will be remembered for his early development work as an amateur radio enthusiast and for his prowess as a photographer. He was a member of the Batti Wallahs' Society and for some years served on the committee.

Mr T. Rowland, A.M.I.E.E., A.M.I.MECH.E., who was deputy engineer and manager of the Peterborough Corporation electricity undertaking until retiring in 1943, died recently.

NEW LITERATURE

Electrical Contractors' Year Book 1959-60

ESSENTIALLY intended for use by those engaged in the contracting industry or others who need to contact electrical contractors in various parts of the country, this edition has been completely revised while largely maintaining the pattern of its predecessors. All members of the Electrical Contractors' Association are listed both in the various sections and alphabetically, while a list of place names provides a convenient cross reference to the branches. A legal section is followed by extracts from the Factories Acts. To complete this very useful work of reference the current wage rates in the industry, and the working conditions, are reproduced in full. Published by the Electrical Contractors' Association. 766 pages, 7¼ in. by 5 in. Price 25s.

The Lead Storage Battery

by H. G. Brown, A.M.I.E.E.

THIS is the fourth edition of an excellent handbook on lead storage batteries for the information of those who are, or are likely to be, in charge of battery installations. It gives all the basic technical data on battery design, installation and maintenance regardless of whether it is a heavy current battery for Post Office repeater stations, car starting, or a small self-priming cell.

Without having the third edition to hand it is not possible to determine the new features, but the last chapter describing the ionic theory of electrolysis has not, so far as we can remember, appeared before. Published by John Sherratt and Son, 161 pages, 8½ in. by 5½ in., 80 illustrations. Price 24s.

A.E.I. (RUGBY) LTD.

Progress in Manufacture—1959

THE year 1959 will go down in history, at least as far as the AEI group of companies is concerned, as one of reorganisation and co-ordination. Following the formation in 1958 of the Turbine-Generator and Heavy Plant Divisions, five new divisions came into being on 1 July, Electronic Apparatus, Motor and Control Gear, Switchgear, Traction, and Transformer. At the end of the year five more divisions came into being, Cables, Construction, Telecommunications and Radio, Electronic Components, and Instrumentation, making a total of 12 divisions in all. These divisions now come under the control of three management companies, AEI (Manchester) Ltd., AEI (Rugby) Ltd., and AEI (Woolwich) Ltd., which have replaced the former Metropolitan Vickers, BTH and Siemens Edison Swan companies whose names now fade away.

In this review the progress of the AEI (Rugby) Group, comprising the Heavy Plant, Motor and Control Gear, and Electronic Apparatus divisions, is surveyed.

Heavy Plant Division

Administrative activities have in no way interfered with output and the Heavy Plant Division has had a busy year. Deliveries of major generating units include a number already commissioned. The first 110 MW alternator for Kariba is now on load, the second and third are being erected on site and the next two are under construction at the works. The fourth 90 MW alternator for Bhakra (Punjab) has been delivered and the construction of the last is also well advanced.

At Owen Falls, Uganda, the eighth 16·7 MW unit has been commissioned and in New Zealand the fifth and sixth alternators are erected at Roxburgh. In Spain the first of two 32 MVA sets for a station on the Eume is ready for commissioning and the second is being erected.

In the works other alternators under construction include two 16 MW units for Kiewa No. 1, Victoria, Australia, three 88 MVA units for Belesar, Spain and the first of four 75 MW units for the CEGB Ffestiniog project.

Among new orders are two sets, one of 15 and one of 6 MW for Livishie and Loch Glashan stations, North of Scotland.

AEI motors with an output of 19,750 h.p. and two 11,600 h.p. motor generator sets are now driving the four stand tandem cold mill at the Abbey Works, Steel Company of Wales, commissioned last summer and motors, including two of 3,000 h.p., are now being installed in the 42 in. blooming mill at Durgapur, India. Other AEI equipment in this important installation includes a 5 MW turbo-alternator and 13 3·5 MVA 11/3·4 kV transformers. At Rogerston, a 8,000 h.p. flywheel motor-generator is being installed for a 144 in reversing plate mill in the Northern Aluminium Co.'s works; a 6,000 h.p. reversing drive for a 12 ft plate roughing mill has been delivered and is now operating at the Scunthorpe works of Appleby Frodingham and equipment, including a 5,000 h.p., d.c. reversing mill motor, two 2,000 kW generators driven by 4,000 h.p. slip-ring motors with control gear, has been shipped to Redcliffe, Southern Rhodesia, for the Rhodesian Iron and Steel project.

New orders for motors and control gear have been received from Australian Electrical Industries (Pty) Ltd., Steel Peech and Tozers, John Summers and Sons, the Northern Aluminium Co. and others.

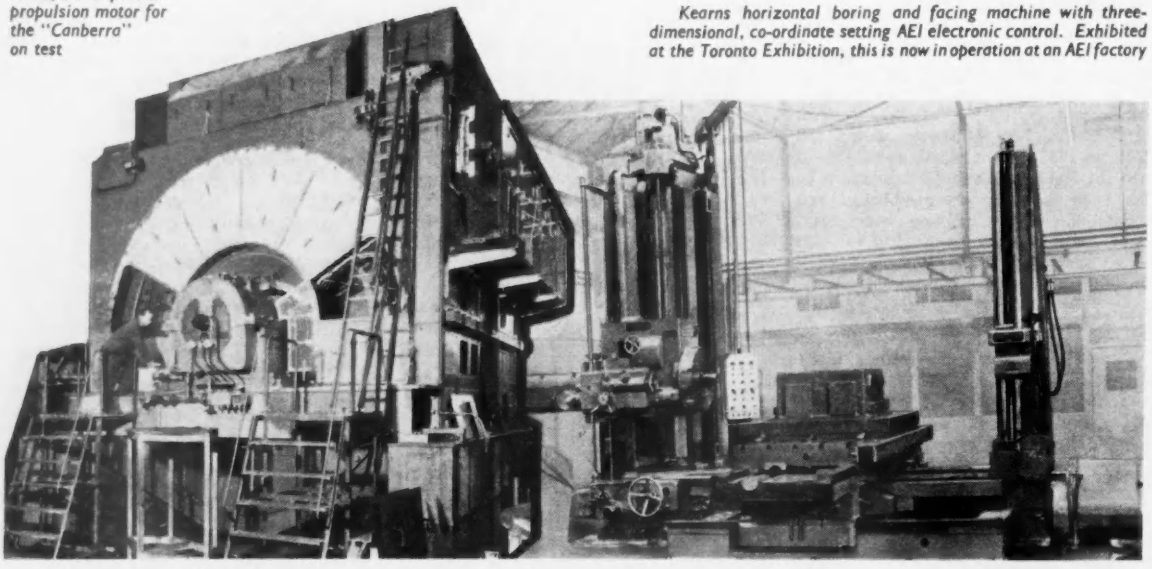
In regard to mining equipment, there has been a slight falling off in new orders, but deliveries and commissioning have been well maintained. The largest twin motor winder ever manufactured with a total r.m.s. rating of 6,700 h.p. and a peak rating of 14,200 h.p. has been successfully commissioned at Saaiplaas, South Africa, and a second one is in course of erection.

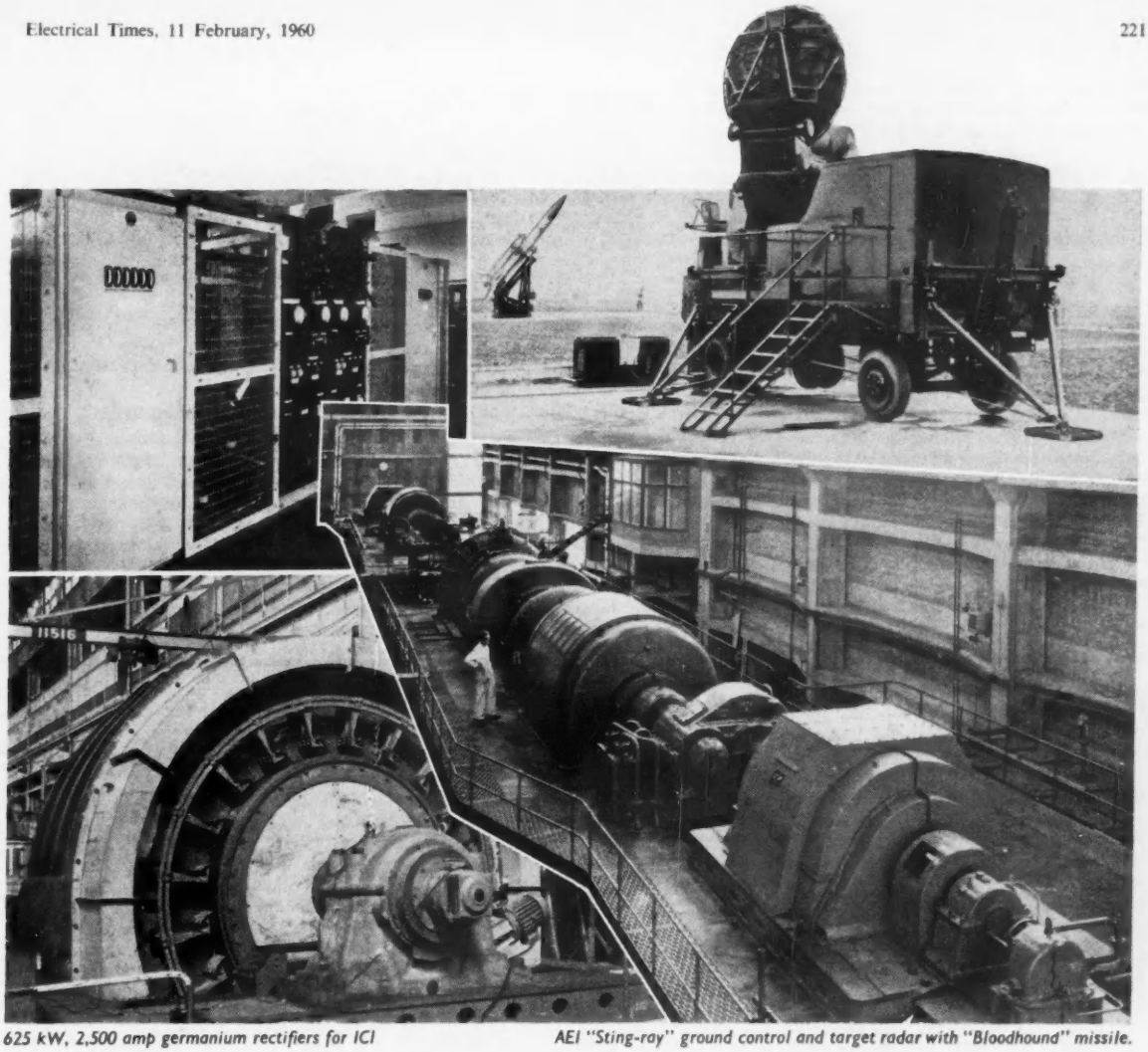
Other winders delivered and commissioned include units for the Great Boulder Mines, Australia and, at home, Silksworth, Hawthorn, Warsop, Bevercotes, Wolstanton, Brodsworth, Killoch, Holmewood, Whitwood, Marquis and Hem Heath collieries. Winders are also in hand for Grimethorpe and Kellingley.

Winder orders received include one for Mufulira, Northern Rhodesia, a

A 42,500 h.p. AEI propulsion motor for the "Canberra" on test

Kearns horizontal boring and facing machine with three-dimensional, co-ordinate setting AEI electronic control. Exhibited at the Toronto Exhibition, this is now in operation at an AEI factory





625 kW, 2,500 amp germanium rectifiers for ICI

AEI "Sting-ray" ground control and target radar with "Bloodhound" missile.

5,000 h.p., d.c. reversing motor for 38 in. blooming mill, Rhodesia

10,000 h.p. motor at RAE high-speed wind tunnel, Bedford

5,200 h.p. winder for Western Reefs, S. Africa and a number for the Coal Board. Orders for motor-generator sets include four, ranging from 1 to 7 MVA, for Bhopal while among the deliveries were 90 and 40 kVA mobile sets to provide 400 cycle outputs at Kai Tak Airport, Hong Kong.

A large number of a.c. motors in excess of 1,000 h.p. have been delivered both at home and abroad including the two 10,000 h.p. induction motors to drive compressors at the high-speed tunnel of the Royal Aircraft Establishment, Bedford. Motor orders received include 3,800 and 2,850 h.p. units for driving compressors at the British Oxygen plant, Margam, a 2,300 h.p. motor for a dry dock pump at Hebburn and two 2,000 h.p. fan motors for Rhodesia.

The demand for pumpless mercury-arc and semiconductor rectifiers has shown a marked increase and includes ten 1,500 kW units for the Victorian Railways, Australia, and others for British steel mills. Germanium heavy current rectifiers have been ordered for aluminium smelting by Norway's largest producer of aluminium, Ardal og Sunndal Verk, for 30,000 amp zinc coating lines at John Summers and Sons, for chlorine production in South Africa, copper refining in the Belgian Congo and on British Railway locomotives.

On the marine side the most interesting contract is for diesel electric propulsion equipment on a new 4,000 ton cable repair ship now being built for the GPO which also covers an electrically driven cycloidal bow propeller to assist manoeuvring. Among the deliveries are the two 42,500 s.h.p. propulsion units for the P and O liner *Canberra*.

Motor and Control Gear Division

Both deliveries and new orders for industrial drives and control equipment at home and abroad have been well maintained. In the metal industries, processes which have been equipped with electric motors and controls include galvanising and electrolytic tinning lines, both at Port Kembla, Australia.

An interesting order received is one for a sintering plant at Cockle Creek, Australia. Textile industry orders have been maintained and several important new paper-mill drives have been commissioned including a tissue machine at Kimberly-Clark's Aylesford mill, the No. 6 newsprint machine, supercalender and winder at the Mersey Division of Bowaters, a 136 in. paper-making machine at Alexander Cowan's Pomathorn mill and a 116 in. sectional drive for Celulosa Argentina. An order for a 13-section machine to produce high quality writing paper has been received from Tasmania and work is proceeding on others from West Africa, New Zealand and British companies.

There has been a steady flow of orders from and deliveries to waterworks and sewage outfall installations and oil refinery equipment has maintained its contribution to the division's activities. In regard to the latter, contracts of interest include equipment for the Esso refinery under construction at Milford Haven, now amounting to over £¼ mil-

lion, and a £¾ million contract for a Shell plastics plant at Carrington.

The same story of maintained orders and flow of deliveries comes from the control gear and aircraft equipment sections of the division.

Electronic Apparatus Division

Work on industrial electronic apparatus is centred on Manchester and Leicester with research and development concentrated at the New Parks laboratories, Leicester. Valve and semiconductor production has now been transferred completely to Lincoln from the Melton Rd works at Leicester.

Apart from the production of semiconductors and valves as components for electronic equipment, the majority of orders are of a type necessitating development work and many of these are on a "one-off" basis. Emphasis, therefore, is on the activities of the laboratories and development sections in this division who have been actively concerned with such pioneer interests as the automatic control of machine tools, including applications of tool setting by co-ordinates, the use of transistors in electric welding, improvements in ignitron design to meet new conditions without reduction in life, applications of photo-electric relays to the indication and control of "flameout" in gas turbines, etc.

Although demand for standard types of electronic motor control have been maintained, there is a steady transfer from amplidyne to magnestat control with transistors as pre-amplifiers. Magnestats are also being used in increasing degree in voltage regulators, one of these being on the *Canberra*.

Other developments which have progressed are the "Magistor" transistor switching system, investigations into the control of a 230 ft dia radio telescope for the CSIRO, regulation of the screwdown of steel-rolling mills from punched tape, nuclear power control mechanisms, high-frequency heating, communication systems and computers. In regard to the latter, perhaps the most important development is the completion of the fully transistorised Type 1010 Digital Computer prototype. One of these will be installed in the new Computer Centre which is being established in Sale. A new analogue computer, the Type 955, has also been completed and the first production model is now ready for test.

Radar and military applications have also received their full share of attention and the experimental model of the "Escort" marine navigational radar set has been tried out with notable success.

Research and Development

Facilities for research and development in all divisions have been extended during the year. Static switching, using transistors in place of contactors has been investigated; a new development laboratory for the study of motor performance has been opened at Newcastle and, for aircraft electrical development work, a new laboratory has been commissioned at Coventry.

Single-channel stereophonic broadcasting

STEREOPHONIC sound reproduction has grown so much in the last few years that although its use at present is confined to recorded sound it is clear that it will eventually become a feature of sound broadcasting. This conclusion is strengthened by considering the attention given to stereophony by the BBC and by the discussions being carried on at international level to try to establish a suitable standard system.

One of the problems presented by stereophony is that it requires two separate sound signals, with accompanying duplication of sensing and reproduction devices (and their associated electronic equipment) to impart the sense of direction to the sound when it is reproduced. Unfortunately, the limited space available in the radio frequency spectrum would make two separate radio transmissions (as the BBC's experimental transmissions have been) too great a luxury to be acceptable and some means of transmitting two signals in a single transmission must therefore be found.

Several systems for doing this have been devised, all involving some sort of compromise between the various requirements. The latest system is a pulse amplitude, time multiplexing method developed by G. D. Browne, of the Mullard Research Laboratories, for use with frequency-modulated transmission. From a demonstration which we were privileged to see last week, it is clear that their system has the advantage of involving only little modification to conventional f.m. transmitters and receivers. It is also compatible with ordinary monophonic transmission, in that a conventional monophonic receiver will be capable of receiving the stereophonic transmission and reproducing a monophonic sound of acceptable quality. Conversely, the stereophonic receiver operating on the Mullard system would be capable of receiving and reproducing a monophonic transmission. Another attractive feature of the system is that it could well be used for such different purposes as the simultaneous transmission of speech in two languages, the listener cutting out one loudspeaker to receive only the desired language.

Briefly, the system operates by mixing (or encoding) the two audio-frequency signals from the pair of microphones in such a way that the resulting complex signal may be readily decoded in a receiver to regain the two original signals. The complex signal is used to modulate the radio frequency carrier which is transmitted and then detected in the receiver in exactly the same way as a normal monophonic signal.

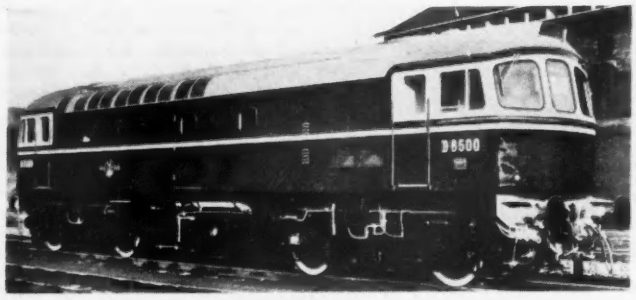
Encoding the audio-frequency signals (which may be conveniently designated A and B) requires the use of a multiplexing signal, which in this case is a sinusoidal oscillation of 32·5 kc/s. This frequency has been chosen as the lowest which may safely be used without interfering with the intelligibility of the audio signal.

Two sine waves are generated in antiphase at this frequency, the amplitude of each oscillation being modulated with one of the audio-frequency signals. The two modulated sine waves are then half-wave rectified.

At this stage, there are thus two signals, one being a series of positive half-waves occurring at intervals of 15·4 μsec (i.e. 32·5 kc/s) whose amplitude is governed by audio signal A, the other, a similar series of the same periodicity, but whose amplitude is governed by audio signal B and whose timing is displaced from the first by exactly one half-cycle. Since the half-cycles of one therefore lie exactly between the half-cycles of the other, the two signals may be mixed, or interlaced, without interfering with each other, to produce a single complex signal in which the separate identities of the audio signals A and B are preserved. It is then only necessary to add a synchronising pulse to one of the multiplexing signals to identify it from the other.

The receiver is modified by the addition of a decoding circuit in which, initially, the synchronising pulses are separated from the complex signal and then used to lock the phase of an oscillator operating at the multiplexing frequency of 32·5 kc/s. The output from this oscillator is rephased by $\pm 90°$ to provide in-phase and anti-phase sine waves which are therefore in synchronism with their counterparts produced in the transmitter. These local synchronised oscillations are used to alternate the operation of electronic switches by which means the A and B components of the complex signal are separated. They are then directed into their respective amplifying and loudspeaker channels.

Where the stereo receiver is receiving a monophonic transmission, there is, of course, neither multiplexing oscillation nor synchronising pulse in the transmitted signal. The local oscillator therefore runs free, and the switching circuit is undiscriminative, passing the monophonic signal into both output channels. Since the local oscillator is well above the audio range, it will not be heard in the final sound reproduction, but an improved signal to noise ratio is obtained if it is stopped.



Electric diesel-train heating

AS part of the Kent Coast electrification scheme by the Southern Region, British Railways, diesel-electric locomotives have been replacing steam engines on sections which are not electrified. For this purpose 15 Type 2 locomotives have been borrowed from the London Midland Region until such time as the Type 3, 1,550 h.p. diesel-electric locomotives, of which 98 are on order, are delivered.

The first of the Type 3 locomotives has just been handed over and has been numbered D.6500. Basically, it follows the broad design of the Type 2 in that it is a twin-bogie unit, but there are several important differences. The six cylinder Sulzer diesel engine of the Type 2 is replaced on the Type 3 by an eight cylinder engine to give an output of 1,550 h.p. at 750 r.p.m. This drives a ten pole d.c. main generator with, on the same shaft, a 235 kW, 800 volt d.c. generator for train heating and an eight pole, 57 kW, 110 volt auxiliary generator. The main generator is rated at 1,012 kW, 1,760 amp and drives four forced fan ventilated 305 h.p. d.c. traction motors.

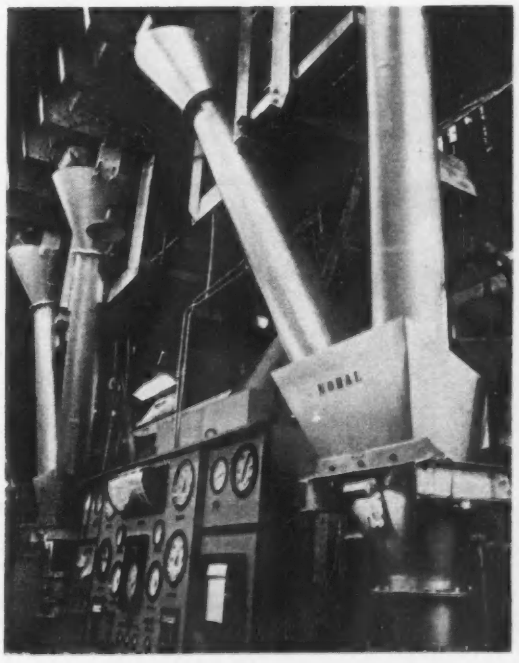
The use of a generator for train heating represents a radical change from other BR designs in which, until now, steam heating has been employed for carriages, the steam being raised in an oil-fired boiler on the engine. The space saved by the elimination of boiler, control gear and water tanks enables a larger diesel engine and generator to be accommodated without increasing the weight or dimensions of the locomotive. In addition, it permits the fuel capacity of the unit to be increased by 300 gall or 60%. With two or more locomotives coupled in multiple, only one, the trailing engine, provides the heating, leaving the diesels of the others to give maximum output for traction. Train heating is under control of the driver with an external indicator visible from ground level for warning staff when coupling. Provision has been made for fitting coaches with either single-pole feed with running rail return or double-pole feed. The latter is to become a BR standard and will incorporate an interlocking device to switch off the heating on the locomotive in the event of accidental uncoupling.

Aluminium Reduces Blockages in Coal Chutes

IT is not always the toughest materials that best resist erosion, as Mr R. G. Henbest, Station Superintendent at Cowes generating station, discovered during the war. Noticing that pieces of aluminium scrap in the coal stocks remained free from corrosion to a remarkable degree, he arranged for an experimental section in Noral 65ST to be made up and included in a new steel chute in 1949. The section was examined annually over the next few years and, when the steel sections were in a state for replacement in 1954, the aluminium sections were so little worn that they were retained for a further period. The total weight loss of the aluminium over the five-year period was only 5 lb, or 8½%, and Mr Henbest noted that the interior surface had taken on a mirror finish.

When he transferred to the CEGB station at Earley, Reading, a pulverised fuel installation, there were many stoppages through blocking of the fuel in the steel chutes. It was therefore arranged for an all welded Noral B54SM, ¼ in. plate, welded chute to be installed in 1953, and this proved so successful that the remaining 13 chutes and hoppers in the station were changed over to the new design. The first chute has now been in service for over 28,300 hr and has conveyed some 60,000 ton of coal without showing appreciable signs of wear. It is estimated that the life will be at least double that of steel chutes. In prime cost, aluminium and steel chutes are about equal. Capital depreciation with aluminium is, therefore, less than half and, as experience has shown, the advantages outweigh any cost considerations that may occasionally arise.

The Noral alloy was supplied by the Northern Aluminium Co. Ltd. and the chutes were fabricated by Lovejoy Bros., tions that may occasionally arise.



Aluminium alloy coal chutes installed in the boiler room at Earley power station. After 28,300 hours they show hardly any sign of wear

equipment for industry

Cheaper Fibreglass

RECENTLY prices of all Fibreglass reinforcing mats, rovings and chopped strands for plastics have been reduced and in future the company will supply these materials only in the low-alkali glass composition known as grade E. The price reduction has been made possible by rationalisation of the company's products and plant extensions. *Fibreglass Ltd., St. Helens, Lancs.*

Piping hot?

A SMALL and inexpensive thermocouple suitable for clamping to pipes will enable heating engineers to keep a check on performance of heating installations. The thermocouples are suitable for measuring temperatures up to 300°C and are designed for simple and quick fixing to a pipe by means of a stainless steel ribbon. They can be used equally well for permanent temperature measurement or for temporary use on laboratory or experimental equipment. *Cambridge Instruments Ltd., 13 Grosvenor Pl, S.W.1.*

Switchgear auxiliary switch

EACH contact on a recently announced auxiliary switch can be set to any of 20 distinct positions for a shaft rotation of 90°. The switch is intended to be mechanically driven and can have as many as 12 separate contacts. Movement of the switch shaft is imparted to the switch contact through a circular moulding. Four projections on shaft plate and contact engage with depressions in the moulding, ensuring a positive drive and also permitting relative adjustment. The contacts are silver-plated and suitable for 30 A with reduced rating for inductive d.c. circuits. The switches will enable sequencing of a number of control or alarm circuits to be adjusted. *General Electric Co. Ltd., Erith, Kent.*

Low conductivity tapes

USERS of cotton wrapping tapes will be aware of the trend requiring tapes of lower conductivity. A tape comparable in cost with untreated tape, but having a conductivity of less than 30 micro-ohm as determined by the water extract test specified by BS 633:1950 is now available. *George H. Wheatcroft and Co. Ltd., Haarlem Mill, Wirksworth, Derby.*

Miniature relays

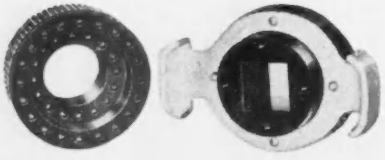
SMALL relays made in Western Germany and designed with the requirements of the electronics and computer engineering industries in mind are now available in this country. The relays have either two or four changeover contacts suitable for a 1 A non-inductive rating at up to 60 V. Usually, silver contacts are fitted, but rare metal contacts can be supplied to meet customer's requirements. Operating power for the four contact version is 0·6 W and the operating time is between 6 and 9 millisecs. The relay measures only $1\frac{9}{16}$ in. square by $\frac{3}{4}$ in. and weighs less than 1 oz. It is normally supplied with a plastics cover and is flash tested to 500 V. *Londex Ltd., Anerley Wks, 207 Anerley Rd, S.E.20.*

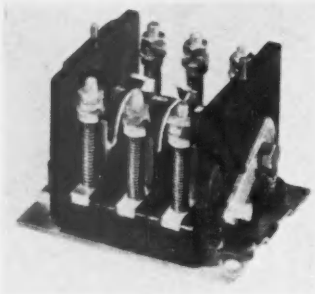
Pipeline economy

SUBSTANTIAL saving in cost is claimed by using a special flange for joining stainless steel or acid resistant phosphor bronze pipework. The central core of the flange, the only part which is usually in contact with corrosive fluids, is formed from stainless steel or other suitable material and this is bonded to a securing flange made from either mild steel or alloy steel. A saving of at least 25% on the cost of flange material is claimed. Flanges can be supplied at short delivery either as blanks or suitable for bolting or welding. The flanges are said to be suitable for ambient temperatures up to 300°C. *Terraspan Ltd., Gate St, Saltley, Birmingham 8.*

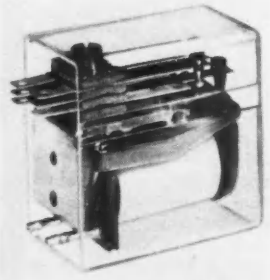
Transistorised frequency meter

TEN ranges on a transistorised analogue frequency meter just introduced permit measurement of a frequency range from 3 c/s to 300 kc/s. Accuracy of the meter is claimed to be largely independent of waveform and is said to be ±2% of full-scale deflection. The instrument can be used for sine wave measurements of amplitude varying from 200 mV to 250 V r.m.s. and for pulse measurements having peak values between 0·5 V and 500 V. The instrument has an input impedance of 250 k ohm and is intended for operation either from a.c. mains or d.c. battery. It measures 10 in. by 7 in. by 8 in. and is suitable for use in ambient temperatures ranging from −10 to +50°C. Each range can be expanded by a factor of 3 or 10 and a socket enables rotational speeds to be measured by a combined photo head and light source. A recorder can also be used with the instrument. *Venner Electronics Ltd., Kingston Bypass, New Malden, Surrey.*

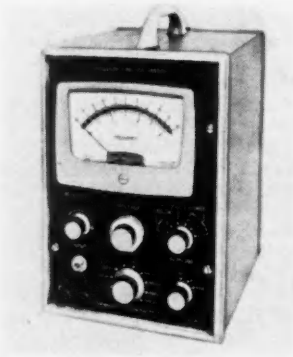




A 3-contact assembly of the mechanically-operated auxiliary switch recently introduced by GEC. Projections on contact and shaft plate engage with depressions on the intermediate moulding giving up to 20 alternative positions, for 90° shaft movement. The shaft plate, contact and moulding are shown above



Two or four changeover contacts, rated 1A, can be fitted to this miniature relay



This transistorised frequency meter has ten ranges covering 3 c/s to 300 kc/s. Dimensions are 10 in. by 7 in. by 8 in. and it can be either mains or battery operated

for the electrical trade

More tube reductions

THE retail prices of Ediswan Mazda 21 in. television tubes, types CRM211, CRM212 and CME2101, have been reduced to £16 as from 1 Feb. (A similar announcement in respect of Mullard tubes appeared in our 5 Nov. issue last year.) The Ediswan Mazda "Extra-Life" repairing and reconditioning service has also been extended to cover all types of 14, 17 and 21 in. electrostatic tubes as well as the magnetic types. *AEI (Woolwich) Ltd., 155 Charing Cross Rd, London W.C.2.*

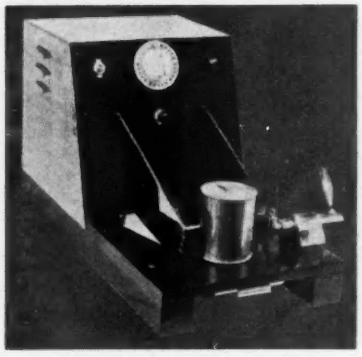
"Soup-a-heater"

HOT soup is among the most popular of dishes in restaurants and snack bars, thanks to our English climate as much as to the excellent quality and flavour of the wide range of branded products on the market today. It is this wide range which can defeat its own object in that, with conventional heating systems, only a very small choice is available to the customer by reason of space limitations on the serving counter.

The wide-awake caterer will therefore welcome a device which can enable him to provide, within a few seconds, a plate of soup, with all of the flavour unimpaired by adulteration, from a selection of brands and recipes to the customers' own choice without limit. Moreover, the customer can see that the soup he is getting is just as the maker prepared it.

The heater is 9¼ in. wide by 20 in. long by 11 in. high and, with a total electrical load of 1·5 kW, will heat the contents of an 8 oz tin within 60 sec at a cost of one-fiftieth of a penny. The tin is placed between electrodes coupled to the secondary of a current transformer and a high current passing around the sides of the tin rapidly heats the contents. A time-switch regulates the heating period which can be adjusted from warm to piping hot. With tins of a standard one-portion size, there is no waste and no waiting.

The price of the appliance, the "Cona" Instant Soup Heater, is £65. *The "Cona" Coffee Machine Co. Ltd., Fielden Wks, Railway Pl, Wimbledon, London, S.W.19.*



The "Cona" Instant Soup Heater provides a can of hot soup within sixty seconds at a cost of 0·02d. Price is £65

New "Metway" products

ADDITIONS to the range of "Metway" domestic appliances recently announced include a fast boiling 4 pt kettle and a food mixer. The kettle is the "Fastway de luxe" (Cat. No. DA.698) and is modern styled in polished aluminium with red handle and red anodised lid. The loading of the replaceable immersion element is 2 kW and the price, 82s 3d including p.t.

The food mixer is the "Mixaway" (Cat. No. DA.19116) and comprises a motor unit, stand and turntable in an attractive combination of cream and pastel blue, two beaters and two glass bowls. The retail price is £23 2s 2d, including 70s 8d purchase tax, and a wide range of extras is also available. The "Mixaway" is now available for delivery; the first deliveries of the "Fastway-de-luxe" are planned for the end of this month.

Though the life of electric kettles is several years, the connector and cable is subject to deterioration with use and may require replacement from time to time. Traders are reminded that there is an attractive pack for display purposes containing two DA26 Standard kettle connectors, retailing at 5s each and one DA909 connector for the super kettle, retailing at 7s. This should serve as a reminder to customers that a loose or faulty connector is not an expensive item to replace. *Metway Electrical Industries Ltd., Metway Wks, Canning St, Brighton, 7.*

Benjamin fluorescents

AN entirely new venture for Benjamin Electric is a range of single- and twin-tube 40 W and 80 W fluorescent fitings with the choice of switch or quickstart control under the generic name of "Litemaster."

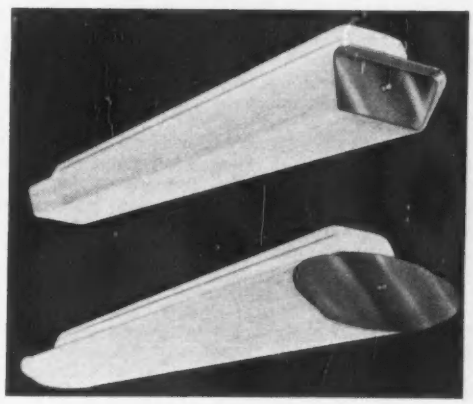
As the illustrations show, these fittings are based on two designs, both of which are simple and effective in appearance, easy to instal and service and they incorporate ballast units which have been proven in service over many years with "Taskmaster" installations. This is the first time that the company has offered a range of commercial fluorescent lighting fittings and is a significant step in their overall policy to broaden the scope of their lighting fittings. The ribbed acrylic diffusers are held in place by end plates, retained in position by a captive nut and by a return edge which slips easily into position on the channel. The difference between Type A and B fittings is in the end plates, the former having stepped features allowing some light to flow from the ends of the diffusers, and the latter having solid end covers. Both may be provided with sparkle holes if desired. There are 16 variations of A and eight variations of B types with choice of colours from swan white, peony red, beacon yellow or anodised gold.

Ballast units and quickstarts are compound filled and switchstart circuits include small two-pin glowswitches.

The prices are as follows:

1—5 ft 80 W	switchstart	A	..	£13 8s 0d
	quickstart	A	..	£14 2s 0d
3—5 ft 80 W	switchstart	A	..	£17 10s 0d
	quickstart	A	..	£19 3s 8d
	switchstart	B	..	£20 4s 5d
	quickstart	B	..	£21 18s 1d
1—4 ft 40 W	switchstart	A	..	£11 19s 5d
	quickstart	A	..	£12 11s 5d
2—4 ft 40 W	switchstart	A	..	£15 0s 9d
	quickstart	A	..	£16 12s 1d
	switchstart	B	..	£17 16s 0d
	quickstart	B	..	£19 7s 4d

All prices include purchase tax. *Benjamin Electric Ltd., Brantwood Rd, Tottenham, London N.17.*



The two types in the new range of 40 and 80 W Benjamin fluorescent lighting fittings

News of the Week

CO-OPERATIVE FAIR TRADING IN THE WEST

Trades Council plan new Centres

SO successful have been the activities of the Western Electrical and Radio Trades Council since its formation in Bristol nine months ago that plans are in hand to open further centres in other West Country towns. The Council, formed originally at the instigation of NECTA, but now operating quite independently, sets out to promote fair trading by investigating and acting on complaints of trading malpractices.

The Council has more than 100 members, including traders, wholesalers, contractors, manufacturers, and the electricity board, each of which is represented on a committee which meets regularly to discuss and report on local trading activities.

"Every complaint investigated so far has been cleared up to the satisfaction of all concerned," the Council's secretary, Mr T. O. Pettit, told "Electrical Times." "Even non-member firms have shown a commendable willingness to co-operate. We should like to see the scheme extended to other parts of the country."

Complaints generally concern discounts, and the supply of goods to unauthorised persons or via unauthorised channels.

Chairman of the Council is Mr S. R. Wilson, a past-president of the Electrical Contractors' Association. The organisation's headquarters is at 17 Wessex Ave, Bristol 7.

Architects hold-up Contractors' Payments

—E.C.A. PRESIDENT

ALTHOUGH the improvement in design in the electrical industry had been quite fantastic in recent years—an architect sometimes had difficulty in selecting from a great number of well-designed fittings—it was still far too easy to obtain poorly designed fittings, according to Mr A. H. Clarke, Bristol City architect.

He told members of the Bristol branch of the Electrical Contractors' Association at their annual dinner last Friday, that he would like to see abandoned all the popular "period" lighting fittings now being produced. He then went on to refer to some street lamp standards as "bare, poorly designed, pre-cast concrete posts which resemble grotesque snowdrops."

Replying, Mr V. J. Stock, president of the ECA, made a counter-attack against architects whom, he said, regarded electrical contractors as of secondary importance. They were rarely prepared to place a contract direct with the electrical industry, preferring to do so through the builder.The result was that the electrical contractor was often kept waiting three or six months after the job was finished before he was even able to recover the cost of his materials.

Electrical contractors were specialists, he maintained, and were entitled to have direct contact where it may be economically sound. Otherwise the architect had the responsibility to see that they were paid, and not leave it to his surveyor to argue for months about the bill.

Green's Acquisition

THE economiser firm, E. Green and Son Ltd., of Wakefield, are purchasing the business of Spurr, Inman and Co., engineers and boilermakers, also of Wakefield, for £36,300 cash.

Further A.E.I. Concentration

THE specialist departments earlier set up by both BTH and Metrovick to carry out industrial electrical installations, which often involves design of special control schemes, continued to operate from Rugby and Manchester with the establishment of the AEI Heavy Plant Division last July.

But with effective co-operation between those two departments within the Division, they have been united in a single new Plant Applications Engineering Department, with headquarters at Rugby. Details of the chief personnel of that dept are given on page 217.

TRANS-PACIFIC CABLE

BRITAIN is to contribute £8,300,000 towards the estimated cost of £26,300,000 for a new telephone cable to be laid between Canada, New Zealand and Australia. Over 8,000 nautical miles long, and in places laid at depths of nearly four miles, the line will include over 300 undersea amplifiers. When completed, possibly in 1964, it will be part of the round-the-world telephone cable system proposed by the Commonwealth Telecommunications conference in London in 1958.

A four-man management committee, one from each country, will control the project. Cable and Wireless will act for Britain in construction, maintenance and finance.

EIRE'S NEW POWER PLAN

A NEW power programme, providing for the addition of 340 MW of generating plant by the Eire Electricity Supply Board by 1965, has been approved by the Minister of Transport and Power. This is planned to meet a continued growth in demand at the annual rate of 7%. Of the additional plant, 160 MW will be fired by milled peat and 180 MW by oil. The plan provides for the absorption by 1968-9 of the annual output of all the bogs which are at present considered economically usable in the production of electricity at various sites.

Before the first plants in the new programme come into operation, the ESB will have put into commission at Rhode, Offaly and Bellacorick, Mayo, 120 MW of new plant using milled peat, increasing the board's generating capacity to 808 MW.

The new plans provide for a milled peat station at Shannonbridge, the doubling in size of the existing coal/oil station at Marina, Cork, and an additional generating set at the Ferbane milled peat station. A new 210 MW station is to be built, but full details of this have not yet been decided.

In announcing this programme, it has been explained that all the more important rivers in Eire are already being utilised for power generation, and the remainder are considered uneconomic.

Harland Reorganisation

IN order to make fuller use of the resources of its parent company, Harland Engineering Co. Ltd., the status and operation of Harland Drives Ltd., a separate wholly owned subsidiary, is to be changed to that of a Division as soon as the necessary administrative reorganisation can be introduced.

Meanwhile, on 1 Feb., management of the subsidiary was transferred to the board of Harland Engineering Co., with Mr H. Cowan-Douglas as chairman and Mr R. W. Weekes as managing director. Clients of Harland Drives will continue to deal with the same personnel as in the past.

£6m Steel Plant Orders

CONTRACTS totalling some £6 million for electrical equipment have been placed with English Electric and AEI by Colvilles for their new steel plant at Ravenscraig, Scotland.

The English Electric order, believed to exceed £4 million, is to equip the semi-continuous hot-strip mill, which will produce steel sheet for cars and domestic appliances, and the universal roughing and slabbing mills. The equipment will include drive motors up to 7,150 h.p., six rectifier banks rated at 1,365 V, 6,126 W, and 17 1,500 MVA 33 kV air-blast circuit-breakers. Manufacturing will be done mainly at the company's Stafford works, and also at Bradford, Liverpool and Kidsgrove.

AEI are to supply £2 million worth of electrical equipment for Colville's new cold reduction plant, including two 2,000 h.p. and six 3,000 h.p. d.c. motors, supplied from two motor generator sets, each driven by a 14,000 h.p. synchronous motor, and four other motors supplied from mercury-arc rectifiers. The order also includes control gear, transformers and switchgear.

"Dryer Hire" scheme for Council tenants

ONE HUNDRED Frigidaire Mk. II spin dryers are to be bought for £2,100 by Camberwell Council for rental to council house tenants at 1s 6d a week. The dryers will be supplied and maintained by Haynes and Orengo Ltd., a local firm, who first suggested the scheme and are offering the appliances at a discount of 25%, enabling the Council to buy them for £20 18s 2d each instead of the normal retail price of £29 8s. The weekly rental charge includes service and maintenance which is estimated to cost £1 a year per machine during a normal life of 10 years.

The plan has provoked strong protest from local traders. Last week the Council received a deputation representing the Camberwell, Peckham and Dulwich Chamber of Commerce, who objected to the "dryer hire" scheme as an unfair and unnecessary intrusion by the Council into the field of trading.

The deputation were concerned that other hire schemes might follow, for appliances such as irons and washing machines. This would "seriously damage local trading structure and prove detrimental to the general public interest."

After due consideration the Council decided that the issue of municipal trading in its wider aspects had no special reference to the spin dryer rental scheme. "It is most desirable that economic drying facilities be available to those tenants who may require them. This is a problem which faces tenants in all types of property, but in particular those who live in upper floor flats who may not have ready access to the back garden.

"We feel we have a duty to help tenants in this situation, and from inquiry made of the deputation, it appears that local traders are not able to offer a service to tenants of the kind we are proposing."

Traders dropped from 'fridge rental project

DAGENHAM Council have decided to go ahead with their refrigerator rental scheme for tenants without the co-operation of local electrical traders. The Housing Committee has recommended that the original plan to supply Electrolux electric or gas models via the local Electricity and Gas Boards should be put into effect as formerly arranged on 1 April this year.

Local dealers have urged that the scheme should be dropped, but if the council insisted on going ahead, they suggested that the plan should be widened to include two Frigidaire models, to be supplied by the traders themselves.

The Housing Committee thought that the 4½ cu ft Frigidaire model was "larger than the council had envisaged would be needed by their tenants," while the 3·4 cu ft model "could, if necessary, be supplied more cheaply by the Eastern Electricity Board." Total cost of the smaller model, it was stated, would be £56 18s 9d via the EEB, and £58 16s 4d via local traders, which would make a difference of 2d a week in repayments.

The committee recommends that the council should supply the two Electrolux models, of 2½ and 3¾ cu ft capacity, for repayments would vary from 3s 5d to 4s 9d a week, depending on size and whether gas or electrically operated.

More than 1,050 tenants have assented to the scheme, in which there is no initial deposit and no additional charge for installation and maintenance.

Asia's biggest atomic reactor is nearing completion at Trombay, near Bombay, India. Picture shows the 450-ft chimney towering over the dome of the reactor, itself 100-ft high, with a jetty for ships running well out to sea. Construction of the reactor is financed by Canada under the Colombo plan, but Indian raw materials will be used in its operation

Duty cut on Instruments

DUTY may be remitted on certain instruments and apparatus imported into the UK, if similar articles are not, for the time being, procurable in Britain. Under the new arrangements, which took effect on 3 Feb., the Board of Trade will consider applications for remission of duty where the amount due is £20 or more, instead of £50. The same minimum limit of £20 applies also to parts of instruments and apparatus.

Items to which the relaxation applies are: optical and scientific instruments and apparatus; measuring and checking instruments and apparatus; apparatus based on the use of X-rays or radioactive substances; thermionic, cold-cathode and photo-cathode valves and tubes; discharge lamps.

Applications will only be accepted in respect of goods on which the full rate of duty is 25% or more and totalling not less than £20 in respect of single instruments, two or more identical models, or production or replacement parts for a single model of instrument or apparatus.

STEEL PRICES DOWN

PRICES of a wide range of steel products, including heavy sections and plates, and tinplate, were reduced on Monday by the Iron and Steel Board. The reductions, together with those introduced in March, 1958, and June, 1959, amount to a drop of some 3% in the general level of steel prices, and have been made possible by improvements in production techniques and efficiency.

MORE H.P.

HIRE-PURCHASE debt owed to household goods shops rose by £16 million in December, compared with increases of £12 million in November and £10 million in October, the Board of Trade reports. Total h.p. debt at the end of 1959 is estimated at £857 million. The large December increase is attributed to the seasonally high level of sales.

Seven of these Type 1 diesel-electric locomotives, worth £400,000, have been ordered from AEI by the London Midland Region of British Railways. This brings the total number of complete Type 1 locomotives ordered by BR from AEI to 44.

Staff College for Technical Teachers

INDUSTRY is being asked to subscribe £100,000 towards a staff college for senior teachers in technical colleges and similar establishments. The appeal has been launched by Sir Alexander Fleck, and £60,000 of the initial target has already been promised. The Ministry of Education has indicated its willingness, once the college has been established, to meet that part of running costs that is not covered from fees.

The idea of such a college has been widely supported. Developing it, Sir Alexander suggested that it would be a small establishment which would provide a series of short courses throughout the year under the general supervision of a director of studies.

The course would be limited to about 20 teachers and ten people drawn from industry and commerce. Teachers selected to attend would probably belong to the senior lecturer grade or above, and the idea would be to foster an adequate supply of personnel for key technical college posts.

The college courses, of perhaps two to four weeks' duration, would provide an opportunity for exchanges of views on curricula and content of courses in the light of technological change, and also of the most effective methods of teaching particular subjects at an advanced level. Above all, they would offer a chance for study and exchange of experience on the problems of administration and the exercise of leadership within the colleges.

If all goes well, it is hoped that the college might start courses in 1961.

Trade Mission for Cairo

A BRITISH trade mission, the first since the Suez crisis, is to leave for Cairo on 23 Feb. to renew trading contacts and examine prospects of increasing trade between Egypt and the UK. The party, comprising businessmen and industrialists, will be led by Mr George Nelson, managing director of English Electric, and vice-chairman of the Advisory Council on Middle East Trade.

The visit, arranged under the auspices of the Advisory Council on Middle East Trade and the Federation of British Industries, is in response to an invitation from the Government of the United Arab Republic.

Talks on Careers

THE annual series of Careers Meetings organised by the Glasgow Education Department Youth Employment Service has now been arranged for certain evenings in March and April. Each meeting will consist of three talks on different types of careers, including electrical and mechanical engineering and sciences, given voluntarily by people prominent in their professions.

The meetings will be held in the St. Andrew's (Berkeley) Hall, Berkeley St, Glasgow C.3, commencing 7.30 p.m., and are intended to help senior secondary school pupils in the area to choose their career. A detailed syllabus of the meetings may be obtained from the Youth Employment Officer, 129 Bath St, Glasgow C.2.

South Bank Site Electricians Go Back

ELECTRICIANS employed by F. H. Wheeler and Co. at the Shell-Mex South Bank site (who had been on strike for about two months over a bonus dispute) returned to work yesterday (Wednesday) morning. They restarted on the understanding that, as recommended by the Committee of Inquiry (to which we referred last week) discussions would take place in the NJIC concerning Clause 8 of the Agreement. Any pay difference decided upon for the men is to be backdated to 10 Feb.

Costs of Coal Research

NEARLY £1½ million is to be spent this year by the nationalised fuel industries on research into the utilisation and gasification of coal. Of this total the CEGB are spending £130,000 and the NCB £680,000 on utilisation. The remaining £590,000 will be spent by the Gas Council for research on coal and oil gasification, gas purification and the treatment of by-products.

These figures were cited in the House of Commons last week by Mr Richard Wood, Minister of Power, who denied a suggestion that the amounts spent on research were "minute," and parried a criticism concerning the Gas Council's expenditure of £230,000 on oil gasification research. This, he explained, is intended to improve the economics of coal gasification.

Guarantees for Rural Supply

THE cost of rural development in many areas is such that an electricity supply can not be installed without a capital contribution or a minimum revenue guarantee from the consumer, the Minister of Power stated last week in the House of Commons.

Rates payments on electrical machinery changed

RATING law in England and Wales defines certain classes of plant and machinery which have to be taken into account in calculating the rateable value of a "hereditament." Some while ago, a Government committee recommended that rather less electrical distribution and generation equipment should come into this category than hitherto, so that electrical power was brought more into line with other means of power. Effect has been given to this recommendation by an order laid before Parliament by the Minister of Housing and Local Government. This provides a new definition of "main transmission of power;" electrical equipment used further along a factory system than this is not, broadly speaking, liable for rating purposes. The limit of main transmission in the case of electrical power is now put at "the first transformer in any circuit, or where the first transformer precedes any distribution board, or if there is no transformer, the first distribution board. Transformer is defined broadly to cover any equipment which changes voltage, frequency or form of current. The Order is presented in much detail, and is not readily summarised. It is to take effect from 1 April, and is issued at SI 1960, No. 122.

OFFICIAL PUBLICATIONS

Rating and Valuation, Plant and Machinery (Rating) order, 1960. S.I. No. 122, HMSO. 4d (see this page).

BS 3185. Heavy duty composite units of air-break switches and fuses. 5s.

BS 905. Interference Characteristics and Performance of Radio Receiving Equipment for Aural and Visual Reproduction. 12s 6d.

Washing machine killed woman

A WOMAN who was electrocuted by a new washing machine had fitted the plug herself, and had connected the wrong wire to the live terminal so that the metal casing of the machine was alive.

This was stated at the Blyth inquest last week on Mrs Mora Cole, aged 22, of Cowpen, Northumberland. A NEEB engineer said he had inspected the plug and found it wrongly connected. The live wire had been connected to the earthing terminal which was attached to the body of the machine.

Mr John Kent, Deputy Coroner for South Northumberland, recording a verdict of accidental death, said: "It would clearly be an easy matter for the electrical dealer to look into the type of plug needed, rather than leave it to the ordinary householder who does not really understand the significance of electricity."

Big U.S. switchgear order for Welsh firm

AN American order for switchgear worth more than £180,000 has been received by South Wales Switchgear Ltd. The contract has been placed by the Los Angeles Department of Water and Power, and is the biggest US order ever received by the firm.

Mr A. J. Nicholas, the company's managing director, said that the right price and personal contact were the two main factors in the deal. When the initial inquiry was received from Los Angeles he had a prototype of the specified circuit breaker made so that photographs could be flown immediately to USA. South Wales Switchgear exports more than a third of its production.

Record Year for Electrical Exports

A NEW export record was achieved in 1959 by the electrical industry. Overseas deliveries totalled £285 million, an increase of £9 million over 1958, and higher by £6 million than the previous record set up in 1957, according to the latest BEAMA figures issued last week.

This total includes power plant and industrial machinery; radio, electronic and telecommunications apparatus; domestic appliances; wires and cables; allied products such as batteries, traction equipment, etc; and certain other categories in the BoT return other than electrical machinery, apparatus and appliances.

Exports of some domestic appliances dropped during the year, though others showed encouraging advances. Notable gains were recorded by steam and water turbines, up by £4 million to £14·7 million; electric motors, up by £1·6 million; and radio, electronic and telecommunications products.

Available figures indicate that exports to North America reached some £30 million, over 10% of the total, and approaching the combined total to Australia and New Zealand. In Common Market countries the position was maintained, a sharp fall in exports to France being more than covered by a considerable increase to Western Germany.

Increased exports were made to African countries such as Ghana and Nigeria, Kenya, Rhodesia and Nyasaland, but falls were experienced in the New Zealand, Malayan, Argentine and Portuguese markets.

The Domestic Appliance Section of BEAMA considered its own export sales at a one-day conference, "Re-arm for Export," held in London yesterday. Among the speakers were Sir Leslie Gamage, president of BEAMA, and Mr Reginald Maudling, M.P., president of the Board of Trade.

NO HURRY FOR NUCLEAR SHIP

BRITAIN could launch a prototype nuclear powered ship using a pressurised water reactor by 1964, the Minister of Transport told the House of Commons last week, but such is the speed of technical development in this field that it might be well worth while waiting a little longer to secure the benefits of either the boiling water or the organic liquid moderated reactor.

Mr Marples, answering criticisms of delay in developing nuclear powered propulsion for ships, emphasised that no decision as to whether a prototype ship should be built would be possible until tenders for a nuclear propulsion unit, for which invitations had been issued, had been received and considered.

Replying to another question, the Minister said that eight proposals relating to six reactor systems for use in ships had been submitted to the Galbraith Committee, which concluded that three were likely to become available for marine propulsion in the next few years. Of the short-term types, the pressurised water system showed the least promise of becoming economically attractive. Tenders are being invited for reactor propulsion units of the other two types.

Engineering Training Conference

A CONFERENCE on "The Changing Pattern of Electrical Engineering Education and Training" is to be held in the Fyvie Hall, The Polytechnic, Regent St, W.1, on 8 March, from 10.30 a.m. to 12.30 p.m. The conference is being arranged by the London and Home Counties Regional Advisory Council for Technological Education, Tavistock House South, Tavistock Sq, W.C.1, to whom application should be made by not later than 26 Feb.

The programme includes talks by Mr E. R. L. Lewis, Controller of Education, English Electric group, and Mr H. W. French, Ministry of Education, followed by a discussion.

Industry's Training Responsibility

THE knowledge and achievement of electrical engineers are advancing at a very rapid rate, and the older members of the industry have a particular responsibility in the training of its younger people, said Sir Willis Jackson, F.R.S., President of the Institution of Electrical Engineers, when speaking at the annual dinner of the South Midlands Centre of the IEE on Friday last.

He referred to the serious discrepancies made by the technical colleges and universities in their provision for training and appealed to small and more highly specialised industrial firms to do all they can, both individually and co-operatively, for our own young people and those from overseas who were dependent on this country for systematic training.

In their subsequent employment we also have a considerable responsibility for setting an example in the kind of way we handle our human problems.

Other speakers at the dinner were: Ald J. H. Lewis, O.B.E., J.P., Lord Mayor of Birmingham; Mr G. F. Peirson, chairman of the South Midlands Centre; and Mr W. S. Lewis, C.B.E., J.P., chairman, Midlands Electricity Board.

Calidec's travelling exhibition, built into a BR railway coach adapted for the purpose, was last month stationed at Glasgow, where visitors were able to see the compactly displayed range of Calidec floor-warming, soil-warming, snow clearing and tubular heating electrical products. This is said to be the first mobile show of its kind to be seen in Scotland

Computer Bureau for the Midlands

A NEW central computing bureau has been opened at English Electric's data processing and control systems division at Kidsgrove, near Crewe, where the company are concentrating all production, research and service activities in connection with computers and control systems under one roof.

The bureau will continue to provide computer time for outside customers on an hourly hire basis, and will maintain and expand the services available until recently at the company's Nelson research laboratories, Stafford. Two DEUCE computers are installed.

In addition, DEUCE computers have been installed at both Liverpool and Glasgow universities where time-hire services are being developed, and English Electric have a second computing bureau at Marconi Hse, Strand, London. Plans are in hand for a bureau which will use the new transistorised KDP.10 processing system, said to be the most up to date of its kind in the world.

E.A.W. Awards

THE Electrical Association for Women's annual award to the school gaining the highest average marks in the certificate examination—the Councillor Miss Walter Rosebowl—has been won by the Dame Allan's School, Newcastle-on-Tyne, who won the trophy in 1955. Runners-up were the Blyth Grammar School, Northumberland, to whom a special cup was presented. A total of 612 certificates were awarded in 1959—a record.

Common in name, but . . .

THE wide ramifications of the businesses of S. Smith and Sons (England) Ltd., are outlined in an elaborately produced brochure. Profusely illustrated, this shows examples of the application of some of the firm's products, from hunting whales to farm machinery. A subsequent section is devoted to research, mass production and training, subjects in which Smith's are pre-eminent.

E.F.T.A. Industrial Council formed

INDUSTRIAL federations of the Outer Seven EFTA countries, together with Finland, are to set up a council for joint consultation on matters of industrial policy affecting their trade relationships with each other and with the rest of Europe.

Objects of the council are:

1. To facilitate the working of the EFTA Convention by the discussion of common problems and difficulties at industrial level.
2. To strengthen existing contacts between individual member federations for the exchange of advice and information in the interest of expanding trade between their respective members.
3. To provide a medium for the continuing examination of means for establishing a multilateral trading system between all the OEEC countries.
4. To provide for the discussion of any other industrial problems of specific concern to the EFTA countries.

Chairman of the council is Mr W. H. McFadzean, president of the FBI. Vice-chairmen are Dr F. J. Meyer Gunthof, vice-president of the Vereinigung Osterreichischer Industrieller, and Mr A. Monrach-Aas, president of Norges Industriferbund. The secretariat will be provided by the FBI.

LECTURES ON WELDING

COURSES to be held at the School of Welding Technology in February and March include: Welding for Junior Management (23-25 Feb.); Inert-gas Arc Welding (7-11 March); and Welded Design and Construction in Corrosion and Heat Resisting Materials (21-25 March).

The third annual lecture of the Institute of Welding will be given on 3 March at 54 Princes Gate, S.W.7, commencing 6 for 6.30 p.m., when W. G. John, deputy director of Naval Construction, Admiralty, will talk on "The Influence of Welding on the Design of Shops." Admission is by ticket from the secretary at the above address.

The spring meeting of the Institute is to be held at Droitwich in the Winter Gardens from 9 to 11 May, and will feature novel welding processes and metal spraying.

3-D NUCLEAR VIEW

TO meet the requirements of nuclear plants and other establishments where dangerous materials have to be remotely handled, EMI Electronics have introduced a new system of stereoscopic closed circuit television.

Two camera channels mounted side-by-side relay pictures to two monitor screens, and the images are then superimposed by means of a mirror and polarised glass. When viewed through polarised spectacles a solid "3-D" picture is produced.

Commonwealth Technical Training Week

INDUSTRIAL training schemes are to be emphasised to the general public during Commonwealth Technical Training Week next year, from 29 May to 4 June. Direct organisation of the scheme will be in the hands of local authorities; the decision about the date has been taken by HRH the Duke of Edinburgh. The objects of the week have been defined as:

To stimulate awareness of the responsibility of the community towards young people entering employment; to stress the importance of schemes of induction and training, both for the benefit of individual firms and of the young people themselves; to give increased opportunity to young people to learn of the opportunities available for training and education; and generally to emphasise the significant place of the young worker to society.

Central organisation has been undertaken by the City and Guilds of London Institute.

TRENDS IN POWER STATION COSTS

—F. H. S. Brown outlines economies

ADVANCES in design of conventional generating plant installed by the CEGB have affected a steady economy in costs. In an article published in *The Times* on Tuesday, Mr F. H. S. Brown, deputy chairman of the CEGB, stated that doubling the size of generating unit reduces capital cost per kW by about 20%. The accompanying table, taken from the article, shows the economies achieved. For completed stations, actual costs are given; otherwise, firm contract prices as at 31 March last. Because of change in value of the pound, savings are greater than appears.

Unit Size	Steam Pressure and Temperature	Year first commissioned	Thermal Efficiency	Capital cost of complete station
MW installed	lb/sq in.; °F		%	£/kW s.o.
30	600/850	1948	26	67
60	900/900	1950	29	57
100	1500/1050	1956	32	58
100*	1500/ 975/ 950	1957	33	59
120*	1500/1000/1000	1958	34	53
200*	2350/1050/1000	1959	36	50
275*	2300/1050/1050	1962	36	41
550*	2300/1050/1050	1963	36·5	39

* *Reheat sets*

Transporting Radiation Sources

INTERNATIONAL regulations for safety when large sources of radioactive material are being transported are to be formulated by a panel of experts meeting in Vienna, under the aegis of the International Atomic Energy Agency. The agency has a broad programme to establish international regulations and recommendations for health and safety in the field of radiation.

Publicity for Tricity

A NEW nation-wide advertising campaign for Tricity cookers, embracing all commercial television stations and the national Press, was launched last week and will continue until mid-March. Using the theme "The cookers *he* would choose and *she* will cherish", the campaign will feature the new Tricity Marquis and Viscount cookers introduced last November. Point of sale material is available for dealers, including price ticket holders, showroom displays, leaflets and broadsheets, via area managers and representatives.

A still from the Tricity TV commercial

RUSSIAN ORDER FOR G.E.C.

AN order for £30,000 worth of printing press equipment comprising eight Electrotab Autopasters and eight sets of tensioning equipment has been received from Russia by Witton-James Ltd., a subsidiary of GEC. They will be used at the Moscow printing plant of *Pravda*.

This is the second big order received by the firm from the USSR. Early in 1958, equipment worth £45,000 was supplied to *Pravda*.

Sayings OF THE WEEK

"The benefits of higher productivity should not be absorbed entirely by increases in either profits or wages, but should be shared with the consumer." . . . MR HEATHCOAT AMORY, Chancellor of the Exchequer, addressing the National Prdouction Advisory Council.

"It is still far too easy to obtain poorly designed fittings and, while there may be occasional use for a 'period' design, I should like to see abandoned all the popular light fittings of the kind which are now being produced." . . . MR A. H. CLARK, Bristol City architect, at ECA branch dinner.

"Many people credit computers with powers far greater than they possess . . . a computer has no intuition, experience or even common sense. It will merely do what it is instructed to, irrespective of whether the instructions are sensible or not." . . . DR R. K. LIVESLEY, of Cambridge University, in a paper to the Institution of Civil Engineers.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, February 9

	£ per ton	Weekly change £
COPPER, standard class A (settlement)	277	+2l
" (3 months)	249½	+5½
LEAD, refined pig, 99·97% purity (cash)	72	−1½
" (3 months)	72⅜	−1⅜
TIN, refined, min. 99·75% purity (settlement)	793	—
(3 months)	789½	+½
ALUMINIUM, ingots 99·99·5%	186	—
" wire bars 99% purity	209	—
BRASS Strip 63/37	232½	+8
SILVER (Troy oz)	79½d	—

	£ per ton	Weekly change £
ZINC, virgin, min. 98% purity (cash)	89¼	−¾
" (3 months)	90	−¼
RUBBER, per lb. No. 1, R.S.S. spot	33⅜d	−2d
c.i.f. basis, ports, April	33d	−½d
ARMOURING: Galv. Steel Wire (0·104 in.)	66½	—
Mild Steel Tape (0·04 × 1½ in.)	53*	—
NICKEL (home)	600	—
MERCURY (76 lb flask)	71½	—
AMERICAN PRICES: Copper, electrolytic (per lb)	35c	—
Lead (New York)	12c	—

* *Tape Price, now on average, includes varnishing*

EMPLOYING THE BULGE

ACTIVITIES of the Government's Industrial Training Council to expand industrial training schemes to meet the "bulge" of school-leavers in 1960-63, are described in the first annual report of the Council published last week. The task of the ITC is not to train young people itself, but to act through employers' associations and bodies composed jointly of employers and trade unions and smaller individual companies to improve their training schemes.

The report gives brief details of progress made by 60 organisations of this nature of which the only one specifically electrical is the Electricity Council. In its work, the ITC can draw up to £75,000 for the period up to March, 1964, for applications to promote training of young people, particularly by assisting in the appointment of training development officers. This grant is available on condition that industry matches it pound for pound. So far, grants have been agreed with three organisations.

In addition, the Council has set up a small staff of training advisers whose services could be called upon by industrial organisations in small industries, to carry out functions similar to those performed by full-time training development officers in some of the larger industries.

Two more miles of Signalling

NEW colour-light signalling was brought into use last weekend over a two-mile stretch of the 12½ miles of track between Bow Road and Upminster on London Transport's District Line. This is part of a £2½ million plan for improving and modernising the line. When complete, the tracks of the London, Tilbury and Southend line will be completely segregated from those of the District Line.

SOVIET TRADE EMBARGO LIST REVISED

A REVISED list of products normally prohibited for export to countries in the Soviet Block and China was announced by the Board of Trade on Friday last. The list makes certain changes: four items have been deleted, including germanium and cobalt compounds, and relaxations have been introduced on several items, including steel works plant, certain electronic equipment and transistors. The embargo now includes a few items of strategic equipment not previously covered.

Lighting the By-pass

THE new Mazda sodium linear lamp is being used in the first full-scale installation of street lighting in Wales. Seventy-eight AEI "Amberline" lanterns mounted on steel poles illuminate the two-mile stretch of dual carriageway on the A470 route from Cardiff to Merthyr known as the Whitchurch By-pass. The scheme was completed in 11 weeks following approval by the Ministry of Transport.

News in Brief

The French equivalent of our Ideal Home Exhibition is to be held from 25 Feb. next until 20 March, at the Grand Palais, Paris. Known as the Salon des Arts Ménagers, it will include a section devoted to electrical equipment as well as a "gallery of modern kitchens."

Annual dinner dance of the Norfolk Electrical Circle will be held at the Lido Ballroom, Norwich, on 2 March, at 7.30 p.m.

Hawyard Tyler and Co. are to supply 24 each low and high pressure glandless pumps for the Trawsfynydd nuclear power station.

Newcastle upon Tyne Housing Committee have decided that the city architect should plan for space heating by electricity or gas in future Council homes.

Over £55 was raised for charity at the north-western branch of ETCTA Ladies' Evening held at the Lancs County Cricket Club pavilion recently.

Company Activities

WHEN markets pause for a "breather", as they did last week, prices idling and a little jaded, be sure the talk will turn to take-over. And in this respect electrical companies had their fair share of attention last week. Hardly was the successful bid by Metal Industries against Electric and Musical Industries for Lancashire Dynamo out the way when voices were heard to assert that a frustrated EMI would put in a bid for the Electric Construction Co. This lifted Electric Construction's £1 ordinary shares by as much as 4s. 3d. to 4s. 9d. at one time making a rise of 6s. 3d. in two days. Takeover denials from both EMI and Electric Construction, however, eased the price back by no more than 9d. to 42s. At one time last year the shares were as low as 27s. 9d. Electric Construction Co. manufactures a wide variety of electrical plant and equipment and also carries on a contracting business. It also has associated companies in Canada, New Zealand and South Africa. Last summer, chairman Mr C. Reid took an optimistic view of the future despite intense competition both at home and abroad, and in face of lower profit margins. Even so the profit record of the company has not been altogether inspiring with net profits after tax in 1950 of £116,000 see-sawing to no more than £118,539 in 1959. Although the 9% dividend is more than twice covered by earnings, a smallish yield of 4·3% would seem to indicate that we have not heard the last of take-over talk with this company. And if a price as high as 50s were put on each share the issued ordinary capital could be bought up for well under £2·5 million.

We then had the rumour that Thorn Electrical Industries, the Ferguson radio group which has close associations with EMI through the jointly owned British Radio Corporation, was interested in E. K. Cole, which also makes radios, TVs, electronic equipment and which also has interests in plastics. So, obligingly, up went the 5s. ordinary shares of E. K. Cole by 2s. 9d. at one time to 32s. 3d., but, again, on denials by both companies, later came back to 31s. 3d. and are now around 30s.

For their money, there would be many who would prefer to take up a holding in E. K. Cole rather than Electric Construction. E. K. Cole's net profit, after tax, has more than tripled from £103,450 in 1950 to £346,373 last year. Over £1 million was raised by a "rights" issue last September to be used on further expansion and chairman Mr E. K. Cole was then sufficiently cheerful about conditions to hope that he would be able to pay the 1959 20% dividend on the increased capital. Moreover, last year's rate was more than three times covered by earnings.

Market interest was also being drawn last week to the Engineering and Lighting Equipment Co., whose 2s ordinary shares have been active around 6s 6d at which level they yield a very attractive £6 3s%. With car production straining to break new records, the Industry's £150 million expansion plans and with the inevitable need for bigger and better roads, attention naturally focuses on the producers of street and road lighting equipment. This is the special province of Engineering and Lighting, and as far back as last summer chairman Lord Verulam was prophesying that the 1959/60 turnover in lighting fittings and standards would be half as much again as in 1958/59. The company is also active in other electrical equipment and light-alloy casting. I rather think we shall hear a lot more about this company as time goes on, and for those wanting to salt away any spare cash they might do well to think about an investment in the Engineering and Lighting Equipment Co.—*From our City Correspondent.*

Barbados Electric Supply Corpn.

Consolidated profit for the year ended 30 June last amounts to £71,531 (*£51,923*), and the dividend is again 5% tax free.

British Electric Resistance Co.

There is to be an issue of 2s Ordinary on the basis of one at 5s for every five held. The board expects to maintain at least the present rate of dividend on the larger capital.

Cable and Wireless (Holding)

With group profits for 1959 up to £1,441,000 (*£1,302,611*), the dividend is maintained at 10% with a final of 2½%. It is proposed to make a one-for-five scrip issue and a one-for-eight rights issue, and it is hoped to continue a 10% distribution on the larger capital.

General Cable Manfg. Co.

The past year's results were the worst experienced by the company since it became a public one in 1935. The chaotic state of affairs in the cable industry resulted in the Rubber and Plastics Section of the business incurring substantial losses. Some amelioration of the situation, we have already reported, but Mr C. W. R. Pantlin, the chairman states that if the present situation is left to work itself out in leisurely stages, the manufacture of power cables over the range, which mainly interests this company and has the greatest market, is unlikely for a period of 18 months to two years to get back to the basis of a reasonable return on the capital employed. Shareholders are clearly warned that they must be patient.

Year to 30 Sept.	£ Trading Profit	£ Net Profit	% on Ord.		Ord. Price	
			Earned	Paid	High	Low
1955	98,504	28,127	30	30	17/3	14/6
1956	231,791	54,051	60	30	13/9	11/-
1957	182,490	41,152	45	24	15/9	11/6
1958	167,954	52,143	42	15	12/3	8/3
1959	61,015	1,670	—	—	9/9	7/3

Goblin (BVC) Ltd.

A continued increase in profit earning ability is evidence that much reconstruction has already taken place and improvement in manufacturing processes is being continued, Mr O. O. Angell, the chairman, reports. The improved net trading profit, reported on 28 Feb., is arrived at after absorbing losses suffered principally by the subsidiary in Canada.

Year to 30 Sept	£ Trading Profit	£ Net Profit	% on Ord.		Ord. Price	
			Earned	Paid	High	Low
1955	291,597	111,332	62	15*	10/3	5/9
1956	94,624	614	—	10	8/9	5/9
1957	104,065	6,874	1	10	8/6	3/9
1958	200,956	48,311	13	7½*	4/11	2/2
1959	328,529	116,135	30	12½	13/3	4/6

* Plus 100% capital bonus.

Harper Eng. and Electronics

For the year to 30 June last, group trading profit is £251,900 and, after tax, the net profit becomes £115,801. The dividend is 30% on the increased capital, as forecast. The company is proposing to purchase all the Ordinary capital of B. O. Morris (Holdings), makers of flexible shaft equipment, in exchange for 1,150,000 Harper 1s shares.

Herman Smith Ltd.

The board have for some time followed a policy of diversifying and expanding the products and interests of the group. Accordingly, the subsidiaries have been engaged in developing new ideas and products and, at the same time, have strengthened their sales organisation, Mr H. G. Smith, the chairman, reports those activities have adversely affected these subsidiaries' contributions to the group profit, but he is confident that benefit will be obtained as the new lines are full expanded.

Venner Ltd.

In the electronic field, there has been a striking advance in intake and execution of orders, with the range of products also increasing. In recent months further agreements have been made with American companies to manufacture and sell their products. Mr G. H. Gunson, director, reports. On the parking meter side, orders have been received at a steady rate, but he warns against the expectation of a vast influx of business in this sphere, although the company is fully capable of coping with a material acceleration in the order rate.

Dividend Declared

Electric and General Investment. Interim 3% (*same*) but on increased capital.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

11 Feb.—Andover B.C. Provision, improvement and/or modifications of electrical installations in 137 pre-war council houses.—See 4 Feb. issue.

11 Feb.—Down C.C. Provision of electrical services in new kitchen and dining hall at Bangor County Schools.—See 28 Jan. issue.

12 Feb.—Bath T.C. Supply of eight weatherproof transformers for road heating.—See 4 Feb. issue.

12 Feb.—Leicester C.C. Supply and erection of ten sodium lamps on 35 ft columns at Thurmaston by-pass roundabout. County Engineer and Surveyor, Grey Friars, Leicester. Deposit £2.

13 Feb.—Grimsby B.C. (c) Electrical installations, on fixed-price basis, in remodelling of Edward Primary Infants' School, Edward St.—See 14 Jan. issue.

13 Feb.—Grimsby BC. (a) Electrical installation on fixed-price basis in new science block at Havelock Secondary School, Holyoake Rd, off Carr La; in Grantham Ave Primary Junior School, off Edge Ave, Scartho.—See 21 Jan. issue.

13 Feb.—Norwich T.C. Supply of lamps for year.—See 4 Feb. issue.

15 Feb.—S. Belfast. Supply of electrical materials for year.—See 4 Feb. issue.

15 Feb.—Berkhamsted R.D.C. (3) Rewiring and lighting installations in council offices conversion at 275 High St.—See 4 Feb. issue.

15 Feb.—Brownhills U.D.C. Electrical installations in: 70 dwellings, Ogley Hay, Brownhills; 72 houses, Leigh Rd, High Heath, Pelsall; 25 houses, Leigh Rd, as separate contracts.—See 28 Jan. issue.

15 Feb.—Dundee T.C. Alterations to lighting in art rooms at Morgan Academy. City Quantity Surveyor, 21 City Sq, Dundee.

15 Feb.—Kent C.C. Supply and erection of 21 200/280 W sodium cut-off lanterns on 35 ft steel columns at Wrotham and Aylesford. County Surveyor, County Hall, Maidstone. Deposit £2 2s.

15 Feb.—Newport B.C. Erection and painting of steel columns and provision/setting to work of sodium lighting system including laying of cables.—See 4 Feb. issue.

15 Feb.—Poole B.C. Supply of: (item 23) wiring supplies, accessories and time switches; (24) lamps; (25) batteries; (26) street lighting lanterns; and (28) water heaters for year.—See 4 Feb. issue.

15 Feb.—Rhyl U.D.C. Supply and erection of (i) 45 reinforced concrete columns, nine wall brackets, 53—3/80 W lanterns, fluorescent lamps and gear, one post-top lantern with 4/80 W fluorescent lamps and gear, four lanterns with 2/80 W fluorescent lamps and gear; (ii) 64 reinforced concrete columns and 140 W sodium discharge lamps and gear.—See 4 Feb. issue.

15 Feb.—Stirling C.C. Supply and erection of: (a) eight reinforced concrete columns and six pole mounting brackets with 14 lanterns, 140 W sodium vapour lamps and auxiliary gear; (b) control equipment and 122 yd of two-wire o/h service line.—See 28 Jan. issue.

15 Feb.—Thetford B.C. Supply and/or installation of 21 Group "A" 25 ft concrete columns with sodium discharge lamps, lanterns and all auxiliary equipment for A11 lighting.—See 28 Jan. issue.

15 Feb.—Tynemouth T.C. Supply of lamps, cables, lamp columns, lanterns, fittings and housing electrical accessories for year to 31 March, 1961.—See 28 Jan. issue.

15 Feb.—Wallasey T.C. Renewal of electrical installation in Riverside School.—Advertised 28 Jan. issue.

15 Feb.—West Hartlepool T.C. Renewal of electrical installation at Technical College, Lauder St.—See 28 Jan. issue.

15 Feb.—W. Riding C.C. Installation of fluorescent lighting at the Registry of Deeds, Wakefield. County Architect, Westfield Rd, Wakefield.

15 Feb.—Whitchurch P.C. Supply and erection of street lighting along Whitchurch By-Pass.—See 4 Feb. issue.

16 Feb.—Barnsley T.C. Supply of (item 2) concrete columns, (13) tungsten and (14) m.v. and sodium lamps for street lighting.—See 4 Feb. issue.

16 Feb.—Dartford B.C. Supply and erection of 17 400 W MBF/U lamps and lanterns on 25 ft reinforced concrete columns along St. Vincent's Rd, the work also includes removal of existing columns. Town Clerk, T. Armstrong, Council Offices. Dartford. Deposit £2 2s.

16 Feb.—Scunthorpe B.C. Applications invited for inclusion in list of contractors for electrical engineering services in new municipal office block, 51,900 sq ft in five-storey and 10,400 sq ft, two-storey council suite to be undertaken on a firm-price basis over two years.—Advertised 28 Jan. issue.

16 Feb.—West Lothian C.C. (f) Electrical work in (contract 3) 66 houses at Bathgate Rd, Blackburn; and (contract 4) 54 houses at Lanrigg Rd, Fauldhouse. Applications to County Clerk, J. Calder, County Bldgs, Linlithgow, by above date.

17 Feb.—Durham C.C. Electrical installations in: Billingham Campus Schools; Broom Cottages Modern School; Jarrow School Clinic. Applications to County Architect, South St, Durham, by above date.

17 Feb.—Haltemprice U.D.C. Supply of (item 18) street lighting lamps and tubes. Engineer and Surveyor, Anlaby Hse, Anlaby, E. Yorks.

17 Feb.—High Wycombe B.C. (1) Supply and erection of steel columns and installation of lanterns, auxiliary equipment, wiring, etc.; (2) supply of 250 W mercury discharge lamps, lanterns and auxiliary equipment.—Advertised 21 Jan. issue.

17 Feb.—King's Lynn B.C. Supply of lamps and sundries for year to 31 March, 1961.—See 4 Feb. issue.

17 Feb.—N. Ireland. Hospital electrical supplies and lamps for year from 1 April, 1960. Secretary, St. Luke's Hospital Management Committee, Armagh.

17 Feb.—Wisbech B.C. Lighting equipment, etc., installations at Money Bank Pumping Station. Engineer, Church Ter, Wisbech.

18 Feb.—Fermanagh C.C. Lighting and heating installation in alterations in County Health Committee offices at Castle Barracks, Enniskillen.—See 4 Feb. issue.

19 Feb.—Belfast T.C. Supplies list items 16 to 40. Advertised 28 Jan. issue.

19 Feb.—Cardiff T.C. Electrical installation, on fixed-price basis, in stage three at Llandaff Technical College.—See 28 Jan. issue.

19 Feb.—Chester-le-Street R.D.C. Item 14: electrical supplies.—See 28 Jan. issue.

19 Feb.—Fylde. Supply of electrical equipment, fittings, ec.—Advertised 4 Feb. issue.

20 Feb. — Dagenham B.C. Wiring of additional lighting point on upstairs landing in 230 properties on Frizlands estate.—See 4 Feb. issue.

20 Feb.—Deal B.C. Supply of lamps for year.—See 4 Feb. issue.

20 Feb.—Garforth U.D.C. Supply of lamps (item 1) for year from 1 April, 1960—See 4 Feb. issue.

20 Feb.—Halesowen B.C. Supply of (item 12) lamps for year to 31 March, 1961.—See 4 Feb. issue.

20 Feb.—Maesteg U.D.C. Supply of (item 22) electrical fittings for year from 1 April, 1960.—See 28 Jan. issue.

20 Feb.—Merthyr Tydfil B.C. Supply of (item 8) electrical goods for year from 1 April, 1960.—See 21 Jan. issue.

20 Feb.—Rustington P.C. Maintenance of street lamps for three years from 1 April, 1960.—See 4 Feb. issue.

22 Feb.—Abingdon B.C. Supply of lamps for year.—See 4 Feb. issue.

22 Feb.—Belfast. Electrical installation in Irish Christian Brothers' Voluntary Secondary Intermediate School for Boys at Glen Rd.—See 4 Feb. issue.

22 Feb.—Chesterton R.D.C. Supply and erection of 28 Group "A" sodium lamps on concrete columns at Caxton. Council Clerk, W. H. Hayward, County Hall, Hobson St, Cambridge. Deposit £2 2s.

22 Feb.—Uxbridge B.C. Supply of (item 16) lamps.—See 4 Feb. issue.

22 Feb.—West Fife. Hospital electrical work maintenance contract for year from 1 April, 1960. Secretary and Treasurer, W. M. Muir, West Fife Hospitals Board of Management, 16 Comely Pk, Dunfermline.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 106 queries answered this week

"Min-Ex" extractor fan—makers of? L.B.—Jones and Stevens Ltd., Easter By-pass, Littlemore, Oxford.

"Thermotime" time/temperature regulator—makers of? E.E.B.—Robert Maclaren and Co. Ltd., Eglington Wks, Kilburnie St, Glasgow C.5.

"Xcel" cookers—address for spares? S.W.E.B.—Selex Electric (Kirkby) Ltd., Yardley Rd, Kirkby Industrial Trading Estate, Liverpool.

Lloyd Instruments Ltd.—address of? M.A.N.W.E.B.—61 Snakes La, Woodford Green, Essex.

"Elson" water heaters—makers of? T.E.—Elsy and Gibbons Ltd., Elson Tank Wks, Havelock St, South Shields, Co. Durham.

"Par-Pak" invertors — makers of? F.D.B.—P.A.R. Ltd., Talbot Wks, Talbot St, Nottingham.

Benham and Sons Ltd.—address for? B.O.D.—66 Wigmore St, W.1.

FURTHER ANSWER

"Mary Ann" irons—address for? G.H. —Repairs should be addressed to Service Division, Tricity Cookers Ltd., 44 Parsonage La, Enfield, Middx, and not Smart and Brown (Engrs.) Ltd.

ANSWER WANTED

"Roka" plastic cable clips with pins—makers of? W.W.

23 Feb.—Orpington U.D.C. Erection of Group "B" columns and installation of associated equipment.—See 4 Feb. issue.

24 Feb.—Newbury B.C. Supply and installation of two identical vertical spindle, unchokeable, centrifugal pumps, together capable of dealing with 1,270 g.p.m.—Advertised 28 Jan. issue.

24 Feb.—Tees Valley. Supply of, item 22, lamps for year to 31 March, 1961. Clerk to the Board, E. A. Morris, Tees Valley and Cleveland Water Board, Corporation Rd, Middlesbrough.

26 Feb.—Crompton U.D.C. Supply of (item 13) lamps for year to 31 March, 1961. Engineer and Surveyor, Town Hall, Shaw.

26 Feb.—Peterborough R.D.C. Erection/installation of steel columns and electrical equipment for 93 Group "A" sodium lighting units. Details from consulting engineers, Stirling, Maynard and Partners, 8 Station Chmbs, Peterborough. Deposit £2 2s. Advertised in this issue.

27 Feb.—Dewsbury T.C. Supply of: Classes "A" and "B" concrete and steel columns; 140 and 45/60 W sodium lanterns; 250 and 400 W m.v. lanterns; lamps; 100/150 W lanterns; swan-neck brackets and spigots; time-switches; cable and control gear.—Advertised 4 Feb. issue.

27 Feb.—Irlam U.D.C. Supply of lamps for year to 31 March, 1961. Council Clerk, Council Offices, Irlam.

27 Feb.—Stanley U.D.C. Supply of electrical materials for year to 31 March, 1961. Council Clerk, J. J. Shipston, Council Offices, Stanley, Co. Durham.

27 Feb.—West Lothian. Repair and maintenance of hospital electrical installations and equipment (including minor extensions) for year from 1 April, 1960. Group Secretary and Treasurer, West Lothian (Bangour) Hospitals Board of Management, Bangour General Hospital, Broxburn.

29 Feb.—Carlow C.C. Two sets of duplicate sewage pumps.—See 4 Feb. issue.

29 Feb.—Royton U.D.C. Supply of (c) lamps for year.—See 4 Feb. issue.

29 Feb.—West Hartlepool T.C. (2) Electrical installation in Brierton Hill Secondary School for Girls. Borough Architect, Municipal Bldgs, West Hartlepool.

1 March—Leckhampton P.C. Supply and installation of 19 140 W sodium discharge lamps on 25 ft columns on A.46. Council Clerk, 259 Old Bath Rd, Cheltenham.

1 March—Salford T.C. Supply of (1) 15 ft concrete columns; (2) 60 W sodium vapour lanterns with ancillary equipment; (3) 100/150 W Class "B" lanterns; (4) solar dial synchronous time switches. Street Lighting Superintendent, 9 Frederick Rd, Pendleton, Salford 6.

2 March—Willenhall U.D.C.—Rewiring of Town Yard. Engineer and Surveyor, Town Hall, Willenhall, Staffs.—Advertised in this issue.

4 March—Midlothian C.C. Supply of (item 9) lamps from 16 May to 31 Dec. County Clerk, County Bldgs, George IV Bridge, Edinburgh 1.

4 March—Notts C.C. Supply and erection of columns, lanterns and switchgear on traffic island on A614.—Advertised 21 Jan. issue.

5 March—Airdrie T.C. Supply of (item h) lamps for year.—See 28 Jan. issue.

5 March—Ashford U.D.C. (c) Rewiring of council houses. Surveyor, 1 Elwick Rd, Ashford, Kent.

7 March—Buckley U.D.C. 7,200 yd of Group "A" lighting: (a) supply, erection and internal wiring of 25 ft concrete columns, 140 W sodium vapour discharge lamps, lanterns and control gear; (b) supply only of 140 W sodium lamps, lanterns, control gear and outreach brackets. Surveyor, Council Chmbrs, Buckley, Flints.—Advertised in this issue.

7 March—Newcastle under Lyme B.C. Supply and installation of 23 200 W sodium vapour Group "A" units on 30 ft plain tubular steel columns on A52.—Advertised 4 Feb. issue.

7 March—Scunthorpe B.C. Wiring to modern standards in 243 council houses in Crosby area (groups of 22, 29, 30, 73 and 89 houses). Housing Manager, H. Atkinson, Housing Dept., Lincoln Gdns, Scunthorpe.—Advertised in this issue.

8 March—Basingstoke B.C. Supply and erection of three pumps with capacity of 2,540 g.p.m. against a 100 ft head of unscreened crude sewage, pumps should be complete with motors, starters, actuating mechanism and ancillary equipment.—See 28 Jan. issue.

8 March—Hastings T.C. Electrical installations in 162 four-storey flats and maisonnettes at Halton redevelopment area.—Advertised 4 Feb. issue.

8 March—Tyne. Supply and erection of three six-ton portal cargo cranes at Tyne Improvement Commission Quay, Albert Edward Dock, N. Shields.—See 4 Feb. issue.

9 March—Bournemouth T.C. Supply of float-operated and electro-magnetic sewage flow recorders. Borough Engineer, Town Hall, Bournemouth.

14 March—Manchester T.C. Electrical installation in Templemead Home for aged persons at Woodhouse Pk. City Architect, P.O. Box 488, Town Hall, Manchester.

No date stated—Hastings B.C. Electrical work in 90 houses at Barley La and All Saints Cres.—See 4 Feb. issue.

Gazette Announcements

COMPANIES ACTS

Luminaire Ltd. Winding up order dated 25 Jan.

Permacold Refrigeration Ltd. Meetings of creditors and contributories to be held at Room 401, Inveresk Hse, 346 Strand, W.C.2, on 17 Feb., at 11.30 a.m. and 12 noon respectively.

Partnership Dissolved

Preston. Partnership between J. P. J. White and M. P. Roche, wholesalers and retailers of electrical and catering equipment carrying on business at James White and Co., White and Roche, and Northern Electrical Distributors at 165 North Rd, Preston, dissolved as from 23 Jan.

Voluntary Liquidation

Bethel and Pitts (Electrical) Ltd., electrical contractors and retailers.

The statement of affairs presented at a recent meeting of showed unsecured liabilities amounting to £18,225 and partly secured creditors for £3,897, while assets were estimated to realise £1,425 this would be absorbed by preferential claims of £1,567, making a deficiency for the general body of creditors of £22,244.

The company was incorporated on 12 June, 1959, with a nominal capital of £500, of which £2 had been issued.

Creditors were informed that proper books of accounts had not been kept and, due to the incomplete state of the records, it had not been possible to prepare trading figures.

After considerable discussion, during which certain creditors expressed their dissatisfaction regarding the company's affairs, a resolution was passed for the appointment of Mr G. H. Eaves, F.C.A., of Harry L. Price and Co., 47 Mosley St, Manchester 2, as liquidator.

BANKRUPTCY ACTS

Intended Dividends

Barnstaple. A. C. Snow, mechanical and electrical engineer, carrying on business as A. C. Snow and Co. at 47 High St, Barnstaple. Last day for receiving proofs for intended dividend 16 Feb. to trustee E. A. Savage, Abbey Gate Hse, College Green, Bristol 1.

Salford. W. Price, electrical maintenance fitter, residing at 41 Cook St, Pendleton. Last day for receiving proofs for intended dividend 12 Feb. to trustee W. H. Meredith, 20 Byrom St, Manchester 3.

Dividend

Portsmouth. S. R. L. Sutton, electrical dealer, carrying on business as Sutton and Sons at 127 Sultan Rd, Portsmouth, Hants. Dividend per £: 4d, payable at Official Receiver's Office, 16 Westwood Rd, Southampton, on 12 Feb.

First Meeting and Public Examination

Guildford. W. E. Harper, dealer in electrical appliances, lately carrying on business at 34 Rectory Rd, Farnborough; 66A High St, Camberley; 4 Fernhill Rd, Cove. First meeting: 11 a.m., 16 Feb., at 58/61 York Terr, Regent's Pk, N.W.1; and public examination: 10.45 a.m., 5 April, at Guildhall, Guildford, Surrey.

TRADE NOTES

Change of Address. J. G. Sneath Ltd. have moved to 13 Soleway St, E.1. Telephone: Stepney Green 4021.

The London depot of Permanoid Ltd. has been moved to larger premises at 17/21 Emerald St, W.C.1. Telephone: Chancery 6543.

New 'Phone No. The telephone no. of General Electric Ltd. at Erith has been changed to Erith 33011.

S.A. Imports. Representation has been made to the South African Government for an increase in duty on household refrigerators of less than 4 cu ft capacity from duty free to 15% *ad valorem*. U.K. firms wishing to make representations to the Union Board of Trade and Industries should communicate with either their Association or the B.o.T. in London.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

24 Feb.—India. 20,000 s.-ph. and 10,000 h.s. polyphase meters. Superintending Engineer, Technical (Electrical), Madras State Electricity Board, 157 Mount Rd, Madras 2. B.o.T. (ESB/3160/60).*

25 Feb.—America. 7·2 kV switchgear, metal-enclosed bus structures, supervisory control panel, annunciator recorder panel, invertor set, invertor control panel battery chargers, carrier current equipment, accessories and spares for Oakridge. U.S. Army Engineer District, Portland Corps of Engrs., 628 Pittock Block, Portland 5, Oregon. B.o.T. (ESB/3441/60).*

26 Feb.—Thailand. Sixteen 69 kV outdoor transformers. Commercial Dept., Metropolitan Electricity Authority, 121 Chakraphet Rd, Bangkok. B.o.T. (ESB/3179/60/ICA).*

29 Feb.—Canada. Two 3 MW diesel generator sets for Quesnel and Prince George. Purchasing Agent, B.C. Power Commission, Box 500, Victoria, B.C. B.o.T. (ESB/3105/60).*

1 March—India. Meter and relay test laboratory instruments for Neyveli Lignite Corpn. (Private) Ltd. Documents, fee 14s 3d, from Director-General, India Store Dept., C.D.N. Branch, Government Bldg, Bromyard Ave, W.3, reference SE-142.

8 March—America. One 230 kV, 105 MVA 3-ph. transformer. U.S. Dept. of the Interior, Bureau of Reclamation, Bldg 53, Denver Federal Center, Denver 25, Colorado. B.o.T. (ESB/3169/60).*

10 March—India. Flameproof star delta starters and air-break distribution switchgear. General Manager, Singareni Collieries Co. Ltd., Kothagudium Collieries P.O., Andhra Pradesh. B.o.T. (ESB/1023/60).*

14 March—Australia. Three machine motor-generator sets with associated control and distribution equipment for Sydney South and Dapto Substations and Carlingford system control centre. Commercial Manager and Secretary, Electricity Commission of N.S.W., Box 5257, G.P.O., Sydney. B.o.T. (ESB/879/60).*

BUSINESS PROSPECTS

Home

Ayrshire C.C. Three-year E.C. school building programme includes: Craigie New Primary School, Ayr (£135,000); new Technical College, Ayr (£500,000); extension of Greenmill Primary to form a Senior Secondary Comprehensive at Mainholm, Ayr (£250,000); new two-stream primary school at Girvan (£140,000); extension and remodelling new Cumnock Junior Secondary (£100,000); replacement of junior school and huts at Catrine Junior Secondary School, £150,000; extension of Carrick Academy, Maybole (£150,000).

Brackley T.C. To erect 50 houses in 1960.

Bury St. Edmunds B.C. Erection of 15 houses at Oliver Rd and Wilcox Ave. Engineer and Surveyor.

Cheshire C.C. Erection of three-form-entry secondary modern school at Mill La, Sutton, Ellesmere Port. County Architect's Office, County Hall. Chester.

Chester-le-Street R.D.C. To erect 124 houses at Ouston. Architect, Estate Office, Birtley.

Cricklade and Wootton Bassett R.D.C. Erection of 10 houses and 10 bungalows at Lyneham. Engineer and Surveyor.

Cumberland C.C. To erect new primary schools at Boltons and Salterbeck and additions to Houghton C. of E. Primary School.

Darlington. Plans for factory extensions at Aycliffe for F. Bookless and Co. Ltd., and Tin Boxes Ltd., approved.

Denbigh C.C. School capital works programme includes: part of Denbigh Modern School, part cost of new modern school at Llanwrst and work at Llysfasi Farm Institute.

Dumfriesshire C.C. £200,000 council offices extension approved.

Edenbridge. 35,000 sq ft unit factories at estimated cost £88,500 approved by London C.C.

Exeter. Roberts and Brown, Barnfield Hill, are architects for junior block (£150,000) at St. Loyes College.

Faringdon R.D.C. Erection of four houses, eight bungalows at Longworth; six houses and 12 bungalows at Faringdon, Berks. Engineer and Surveyor, Market Pl.

Glasgow. Keppie, Henderson and Gleave, Woodside Pl, are architects for £170,000 extensions at Glasgow School of Art.

Glastonbury B.C. Recommended to approve the erection of 21 dwellings at Windmill Hill in 1960.

Gosport B.C. Plans proposed for £200,000 additional accommodation at Town Hall.

Halewood. Ford Motor Co., Dagenham, plan a £25 million car body factory.

Hampshire C.C. Additions to Andover County Secondary Girls' School; East Tisted C.E. School and Havant Front Lawn Junior School and courthouse, police station and offices at Totton. County Architect, The Castle, Winchester.

Hawick. £18,000 factory for Scoon and Hood Ltd., Teviotdale Mills approved by Dean of Guild Court.

Herefordshire C.C. Erection of first instalment of new school at Garway and additions at Leominster Grammar School. County Architect, Bath St, Hereford.

Houghton-le-Spring. Howard Collings Group propose conversion of Coliseum Cinema into shops. Architect: I. Hodges, 52 Upper Berkeley St, W.1.

Huddersfield T.C. Erection of first of two hostels each consisting of a nine-storey block of accommodation for 173 students at Technical Teachers Training College. Borough Architect, High St, Bldgs.

Leeds. Regional Hospital Board have approved £1,030,000 modernisation at Menston Hospital.

Lindsey C.C. Erection of: (a) two-form-entry infants' school at Heapham Rd, Gainsborough; (b) extension to Gainsborough Technical College; (c) extensions to Barton-on-Humber Grammar School. County Architect, Lincoln.

Liverpool T.C. Erection of 12 flats Belem Tower, Aigburth Dr; 23 dwellings Heath Rd, Greenhill Rd. City Architect, Dale St.

Melton Mowbray U.D.C. To erect 156 houses in 1960.

Middlesbrough T.C. To consider fresh tenders for 10 bungalows, 32 flatlets and four houses at Thorntree.

Montgomeryshire C.C. Erection of new grammar school at Welshpool. County Architect, Newtown.

Oakham R.D.C. To erect 18 bungalows and 16 houses in 1960.

Rochester T.C. Erection of 26 houses and 12 flats in Warren Wood redevelopment. City Surveyor, 66 Maidstone Rd.

Rosyth. Admiralty are to erect new £200,000 headquarters block at Rosyth Dockyard.

Salford. Extensions and adaptations for E.C. at Cromwell Secondary Modern School. Architects: Cruickshank and Seward, 196 Deansgate, Manchester.

Sheffield T.C. Provision of 400 c.f.m. fans, 300 g.p.m. pumps and electrically operated penstocks for Blackburn Meadows Sewage Works. Town Clerk.

Southall. Erection of £130,000 admission wards at St. Bernard's Hospital for N.W. Metropolitan Regional Hospital Board. Architect, 40 Eastbourne Terr, W.2.

South Shields. Further factory extension of 6,000 sq ft proposed for S. Newman Ltd., lingerie manufacturer. Architects: J. Cotton, Ballard and Blow, Haymarket Hse, Newcastle upon Tyne.

Spennymoor. G. A. Gray Ltd., mineral water manufacturers, Low Grange Rd, Spennymoor, are to extend their factory.

Staveley U.D.C. To erect 38 houses and 20 bungalows on Middlecroft estate and four bungalows in Chesterfield Rd (£89,323).

Sunderland. N.E. Trading Estates Ltd., Team Valley, are to extend factories for Ericcson Telephones Ltd., and Gresley Machine Co. Ltd.

Sunderland. New factory for Sixty Minute Cleaners Ltd. approved. Architects: S. W. Milburn and Partners, 9 Esplanade.—Rank Organisation are considering converting the Gaumont Cinema, Fawcett, into shops and offices to outline plans by Ardin and Brookes, 129 Mount St, W.1.

Swansea T.C. Erection of block of shops and maisonnettes at Port Tennant Rd. Borough Architect.

Ulverston R.D.C. Conversion of "Todbusk" in Springfield Rd into council offices. Council Clerk.

Whickham U.D.C. To build 69 houses at Athol St and Victoria St, Dunston. Architects: Fennell and Baddiley, Bridge End Chmbs, Chester-le-Street.

Winchester T.C. Erection of 44 dwellings on Winnall Manor estate. Quantity surveyors: A. S. Wilson and Partners, 8 Storey's Gate, S.W.1.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

British Thomson-Houston Co. Ltd. To acquire and hold any shares, stocks; to carry on business of electrical, mechanical, chemical, heating, electronic and nuclear engineers, etc. Nom. cap.: £100. Subs.: A. D. Gregory, 5 Fisher Ave, Rugby and A. E. Wilson, 27a Albert St, Rugby.

Denfield Electrical Co. Ltd., 19 Brockley Cross, New Cross, S.E.14. Nom. cap.: £100. Dirs.: S. G. Rand, T. D. J. Smith and R. A. Levy.

Elite Refrigeration and Electrical Co. Ltd., 60 Rosemary Rd, Clacton-on-Sea. Nom. cap.: £5,000. Dirs.: Ivy L. Mockford and Charles E. Mockford.

S. J. Emery Ltd., 123 High St, Ilfracombe. Radio, television and electrical engineers, etc. Nom. cap.: £1,000. Dirs.: Sidney J. Emery and Mrs E. E. Emery.

Erith Electrics Ltd., 24 Lesney Pk, Erith, Kent. Nom. cap.: £500. Dirs.: Robt. W. McConnell and Florence E. McConnell.

Health Ray Co. Ltd., 50 Portland Terr, Southampton. To carry on business of manufacturers of and dealers in ultra-violet and infra-red lamps, etc. Nom. cap.: £1,000. Dirs.: Ernest W. Arculus and Kathleen I. R. Morris.

Heaton Electrical Co. Ltd., 108 Alexandra Rd, Moss Side, Manchester 16. Nom. cap.: £100. Dirs.: Sidney W. Rothwell and Mrs B. Rothwell.

Hicks and Fallon Ltd., 850 Wimborne Rd, Bournemouth. To carry on business of electrical contractors, etc. Nom. cap.: £100. Dirs.: W. Hicks, A. Fallon, Mrs Elsie N. Hicks and Mrs Gladys M. Fallon.

Hirst and Son (Leeds) Ltd., 205 Jack La, Leeds 10. To carry on business of electrical engineers and general electrical installation contractors, etc. Nom. cap.: £1,000. Dirs.: H. Hirst and Mrs B. Hirst.

Industrial Interior Suppliers Ltd., 194/196 Garth Rd, Lower Morden, Surrey. Nom. cap.: £100. Electrical contractors, etc. Permanent dirs.: Cyril E. Davies and Margaret I. N. Davies.

Marine and Electrical Supplies Ltd., 242 Hanworth Rd, Hampton, Middx. Marine and electrical engineers and builders, etc. Nom. cap.: £100. Dirs.: R. W. Baynton, H. D. Baynton and K. M. Gibbs.

Metropolitan-Vickers Electrical Co. Ltd. Nom. cap.: £100. Dirs. not named. Subs.: Cecil Dannatt, Hawley Lodge, Hawley La, Hale, Ches, and Norman Slee, "Stanhill," De Lamer Rd, Bowdon, Ches.

Polo Refrigeration and Electrical Appliances Ltd. Nom. cap.: £300. Dirs.: H. R. Harper, 2 Station Rd, Crewkerne, Som; and M. T. Harper, 53 Furland Rd, Crewkerne, Som.

Three Phase Ltd., 9 Taylors La, N.W.10. Electrical engineers, etc. Nom. cap.: £100. Dirs.: Gordon G. Wright, Mrs Jeanne M. Wright and George A. Wright.

CONTRACTS PLACED

Cwmbran D.C. Erection of 42 Group "A" steel lighting columns, Abacus Eng. Ltd.

Dewsbury B.C. Electrical installation in new secondary technical school, Southern and Redfern Ltd., £10,735. Recommended.

Durham C.C. Electrical installations in: Durham City new branch library, F. B. White, £1,844; Felling Leam La new Modern School, T. Mitchelson (Electrical) Ltd., £6,835; new additions to Shiney Row County and Modern Schools, Hodgsons (Houghton-le-Spring) Ltd., £742. Recommended.

Hartlepool T.C. Street lighting in King Oswy Dr extension, Engineering and Lighting Equipment Co. Ltd., £1,044 4s.

London C.C. Supply and installation of water heaters in 240 dwellings on Becontree estate, F. J. Baynes and Co. Ltd., £14,761 5s 6d.

Newcastle upon Tyne T.C. Lighting improvements at Heaton Grammar and High Schools, Robson and Coleman Ltd., £2,587. Recommended.

Skipton U.D.C. Supply of 90 Group "B" steel columns, Abacus Eng. Ltd.

MEETINGS TO NOTE

THURSDAY, 11 FEB.

I.E.E. (N.W. Scotland Sub-Centre). "The Design and Performance of the Gas-filled Cable System." Electrical Eng. Dept., Queen's College, Dundee. 7 p.m.

I.E.E. (W. Wales Sub-Centre). "Electrical Shock," H. Dickinson. Conference Room, S.W.E.B. Showrooms, The Kingsway, Swansea. 6 p.m.

A.S.E.E. (Bradford Branch). "Recent Developments in Metal Rectifiers," D. Magnall. Midland Hotel, Bradford. 7.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Control and Data Processing Sections). "Measurement, Automatic Control, and Data Reduction as Applied to a Cycle Plant," T. A. Lucas, Manson Hse, Portland Pl, W.1. 7 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Liverpool Section). "Training the Instrument Engineer," D. P. Lant, M.A.N.W.E.B. Industrial Development Centre, Paradise St, Liverpool. 7.15 p.m.

A.S.E.E. (S.W. London Branch). "Protective Equipment for Industrial Plant," Dr W. L. Stern. Prince of Wales Hotel, S.W.19. 7.45 p.m.

INSTITUTION OF PLANT ENGINEERS (N.E. Branch). "Selection of Electric Motors for Industrial Purposes," H. C. Ruffle, Roadway Hse, Oxford St, Newcastle. 7 p.m.

I.E.S. (Manchester Centre). "Lighting in Relation to Modern Ceilings and Roofs," D. Phillips. Demonstration Theatre, Town Hall Extension, Manchester. 6 p.m.

INSTITUTE OF PHYSICS (Liverpool and N. Wales Branch). "Nuclear Models," Dr L. L. Green. Liverpool University. 7 p.m.

INSTITUTION OF MECHANICAL ENGINEERS (Steam Group). Discussion: "The Case for the Development of Steam Turbines up to 10,000 kW Capacity for Higher Steam Pressures and Temperatures." 1 Birdcage Walk, S.W.1. 6 p.m.

FRIDAY, 12 FEB.

I.E.E. (N. Scotland Sub-Centre). "The Design and Performance of the Gas-filled Cable System," E. P. G. Thornton and D. H. Booth. Robert Gordon's Technical College, Aberdeen. 7.30 p.m.

I.E.E. (N. Staffs Sub-Centre). "Provision of Adequate Electrical Installations in Buildings." (a) "Multi-storey Flats and Maisonnettes," C. A. Belcher: "Houses," C. C. Hyams. Technical College, Stoke-on-Trent. 7 p.m.

I.E.E. (N.E. Graduate and Student Section). "Power from the Atom," K. W. Huddart. Grey Hall, King's College, Newcastle. 6.30 p.m.

ROYAL INSTITUTION. "Fuel Cells: Will They Soon Become Major Sources of Electrical Energy," F. T. Bacon, 21 Albemarle St, W.1. 9 p.m.

I.E.E. (Southern Centre). "Transistors," N. Bridgeman. S.E.B. Showrooms, Newport, I.W. 6.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Midlands Section). "Automatic Weighing," R. W. Seymour-Lee. Lecture Theatre, Gosta Green College of Technology, Aston St, Birmingham. 7 p.m.

INSTITUTE OF PHYSICS (S. Wales Branch). "The Physics of Fully Ionised Gases," Dr H. T. Miles. University College, Swansea. 5.15 p.m.

INSTITUTION OF PRODUCTION ENGINEERS (Eastern Region). "Economics of Battery Truck Operation in a Particular Factory," H. C. Hawkins. Golden Lion Hotel, Cornhill, Ipswich. 7.30 p.m.

MONDAY, 15 FEB.

I.E.E. (Mersey and N. Wales Centre). Hunter Memorial Lecture. "The Protection of Electrical Systems," H. G. Bell. Donnan Laboratories, Vine St, Liverpool. 6.30 p.m.

I.E.E. (N.E. Measurement and Electronics Group). "Progress in Permanent Magnetic Materials," J. E. Gould. Rutherford College of Technology, Newcastle. 6.15 p.m.

I.E.E. (Sheffield Sub-Centre). "D.C. Winder Drives using Mercury-arc Rectifier Inverters," L. Abram, J. P. McBreen and J. Sherlock. Angel Hotel, Brigg. 7 p.m.

I.E.E. (Western Supply Group). "Operation of Large Electrical Supply Systems," L. B. Law. Demonstration Theatre, Electricity Hse, Colston Ave, Bristol 1. 6 p.m.

ROYAL SOCIETY OF ARTS. Cantor Lecture, "The Fuel and Power Industries and National Prosperity," Dr A. Parker. John Adam St, W.C.2. 6 p.m.

I.E.E. (London Graduate and Student Section). "Inertial Navigation Systems," Wing-Cmdr E. W. Anderson. Savoy Pl, W.C.2. 6 p.m.

I.E.E. (Southern Centre). Faraday Lecture, "Electrical Machines," Prof M. G. Say. Guildhall, Southampton. 6.30 p.m.

BIRMINGHAM ELECTRIC CLUB. "High Speed Photography in Electrical Research," J. Hadland. Grand Hotel. 6.15 p.m.

IPSWICH AND DISTRICT ELECTRICAL ASSOCIATION. "An Introduction to the Age of Nuclear Power," W. G. Busbridge. Electric Hse, Ipswich. 7.15 p.m.

A.S.E.E. (Bristol and W. Branch). "Port Electrical Installations," S. Evans. Grand Hotel, Bristol. 8 p.m.

TUESDAY, 16 FEB.

I.E.E. (Measurement and Control Section). Discussion, "Soviet Control Engineering Progress." Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (E. Midland Centre). "Electrification of the U.K.A.E. Industrial Group Factories," J. W. Binns and W. J. Outram. E.M.E.B. Centre, Charles St, Leicester. 6.30 p.m.

I.E.E. (N. Midland Utilisation Group). Sheffield Sub-centre Chairman's address. Leeds and County Conservative Club, South Parade, Leeds 1. 6.30 p.m.

I.E.E. (N.W. Measurement and Control Group). "Thermistors—Their Theory, Manufacture and Application," R. W. A. Scarr and R. A. Setterinton. Engineers' Club, Albert Sq, Manchester. 6.15 p.m.

I.E.E. (S.E. Scotland Sub-centre). Assessment of Speech Communication Links," D. L. Richards and J. Swaffield. Carlton Hotel, North Bridge, Edinburgh. 7 p.m.

I.E.E. (Southern Centre). "A New Cathode-ray Tube for Monochrome and Colour Television," D. Gabor, P. R. Stuart and P. G. Kalman. Farnborough Technical College, Boundary Rd. 6.15 p.m.

I.E.E. (Bristol Graduate and Student Section). "Servo Mechanisms," K. I. Bartlett. University of Bristol. 7 p.m.

ROYAL INSTITUTE OF BRITISH ARCHITECTS. "Freedom in Lighting Design," Dr R. G. Hopkinson and J. Beckerdike. 66 Portland Pl, W.1. 6 p.m.

SCOTTISH DAIRY SHOW at Kelvin Hall, Glasgow, until 19th.

N.E. ELECTRICAL CLUB. Ladies' Night at Old Assembly Rooms.

I.E.S. (Liverpool Centre). "Light and Horticulture," A. E. Canham. M.A.N.W.E.B. Industrial Development Centre. 6 p.m.

A.S.E.E. (Aldershot Branch). "Safety and the Supervisor," H. E. M. Thomas. Queens Hotel, S. Farnborough, Hants. 7.30 p.m.

A.S.E.E. "Current Practices and Recent Trends in Cable Joints and Terminations," H. Flack. Manson Hse, 26 Portland Pl, W.1. 6.30 p.m.

A.S.E.E. (Oxford Branch). "Radio Astronomy," Dr A. D. Petford. Employment Exchange, Oxford. 8 p.m.

WEDNESDAY, 17 FEB.

I.E.E. (Sheffield Sub-centre). "Engineering Education at the Technical Universities in Western Germany," D. B. Welbourn, Prof D. B. Spalding and G. L. Ashdown. Grand Hotel, Sheffield. 6.30 p.m.

I.E.E. (S.W. Scotland Sub-centre). "Survey of Stereophony," T. Somerville. Broadcasting Hse, Queen Margaret Dr, Glasgow. 6 p.m.

I.E.E. (Rugby Sub-centre). "Progress in Permanent Magnet Materials," J. E. Gould. Rugby College of Technology and Arts. 6.30 p.m.

I.E.E. Faraday Lecture, "Electrical Machines," Prof M. G. Say. Central Hall, Westminster. 6 p.m.

INSTITUTION OF MECHANICAL ENGINEERS (Automobile Division). "Electrical Equipment of the Automobile," E. A. Watson. 1 Birdcage Walk, S.W.1. 6 p.m.

INSTITUTE OF ELECTRICITY ADMINISTRATION. "The Nature of Plastics and some of their uses," R. D. Bacon. Bonnington Hotel, Southampton Row, W.C.2. 6.30 p.m.

INSTITUTION OF PLANT ENGINEERS (Mersey and N. Wales Branch). "Industrial Lighting in Factories," A. Wilcox. British Lighting Council, Manchester. 7.15 p.m.

A.S.E.E. (Wolverhampton Branch). "Fire Prevention in Industry," Station Officer M. Gee. Chamber of Commerce, District Bank Chmbs, Lichfield St, Wolverhampton. 7.45 p.m.

A.S.E.E. (Nottingham Branch). "Automatic Fuel Control," S. F. Snowdon. E.M.E.B. Showroom Theatre, Carrington St, Nottingham. 7.30 p.m.

THURSDAY, 18 FEB.

I.E.E. (Utilisation Section). "Electricity in the Manufacture of Hydrogen Peroxide," B. E. A. Vigers. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (S.W. Sub-centre). "The Provision of Adequate Electrical Installation in Houses," C. C. Hyams. Electric Hall, Torquay. 3 p.m.

I.E.E. (Irish Branch). "Television Systems," H. De Lacy. Physical Laboratory, Trinity College, Dublin. 6 p.m.

S. WALES INSTITUTE OF ENGINEERS. "Nuclear Energy from Fission and Fusion Reactions," Dr T. E. Allibone. Park Pl, Cardiff. 6 p.m.

MINISTRY OF WORKS. "Safety in the Building Industry," J. A. Hayward. Hertfordshire College of Building, Hatfield Rd, St. Albans. 7.15 p.m.

INSTITUTE OF FUEL (N.W. Section). "Problems with the Use of High Sulphur Oil Fuels at Marchwood Power Station and Experience with Chemical Additives," T. J. Wilkinson and D. Clarke. Engineers' Club, Albert Sq, Manchester 2. 7.30 p.m.

CHELMSFORD ENGINEERING SOCIETY. "Design in Engineering Products," L. B. Archer. Social Hall, Hoffmann Mnfg. 7.30 p.m.

INSTITUTION OF PRODUCTION ENGINEERS. "Horizontal Boring Machine Development including Electronic Control," C. A. Sparkes. 39 Elmbank Cres, Glasgow C.2.

SOCIETY OF INSTRUMENT TECHNOLOGY (Bristol Section). "Transducers," R. Russ. Bristol University, Department of Physics, Bristol 8. 7.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (E. Midland Section). "Instrument Engineering at the National Institute for Medical Research," W. C. Lister. Derby College of Technology, New Bldg, Kedleston Rd, Derby. 7.15 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Tees-side Section). "The Errors of Instruments—their Study and Importance," H. Kenney. Cleveland Scientific and Technical Institutes Corpn. Rd, Middlesbrough. 7.30 p.m.

FRIDAY, 19 FEB.

I.E.E. (E. Midland Centre). Dinner-dance. Victoria Station Hotel, Nottingham. 7.30 p.m.

I.E.E. (N. Staffs Sub-centre). Annual dinner. Crown Hotel, Stone. 7.30 p.m.

JUNIOR INSTITUTION OF ENGINEERS. "The Design Features of Large Radio Telescopes," J. Heywood. 14 Rochester Row, S.W.1. 7 p.m.

I.E.E. (Rugby Sub-centre). Faraday Lecture, Prof M. G. Say. Temple Speech Room. 7.30 p.m.

INSTITUTE OF PHYSICS (Non-destructive Testing Group). "Electroluminescent Image Intensifiers," Dr P. Schrgen. 47 Belgrave Sq, S.W.1. 6 p.m.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Audiomatic. 793,663. Class 10. Electromedical acoustic apparatus, etc. Multitone Electric Co. Ltd., 12/20 Underwood St, W.1.

Bikini. 794,134. Class 9. Apparatus, etc. Fielden Electronics Ltd., Paston Rd, Wythenshawe, Manchester 22.

Bob-all. 795,587. Class 10. Apparatus for vibratory massage. M. A. L. Hornes, 16 Davies St, W.1.

Decorna. 794,012. Class 11. Deep freeze apparatus. Delta Eng. Co. (Liverpool) Ltd., 1a Liverpool Rd, Gt. Crosby, Liverpool 23.

Maximag. B790,312. Class 6. Black bars, bright bars and extruded sections all for electro-magnetic purposes, etc. Low Moor Best Yorkshire Iron Ltd., Iron Wks, Low Moor, Bradford.

Monotronic. 794,258. Class 9. Automatic temperature controlling instruments. Rheostatic Co. Ltd., 94 Farnham Rd, Slough, Bucks.

Ronson. B792,026. Class 7. Hair drying machines, etc. Ronson Products Ltd., Winchester Hse, Old Broad St, E.C.2.

Schierit. 776,190. Class 9. Electrodes, contacts, etc. Richard Schier, Kiehl-Ufer 43, Berlin-Neukolln, Germany.

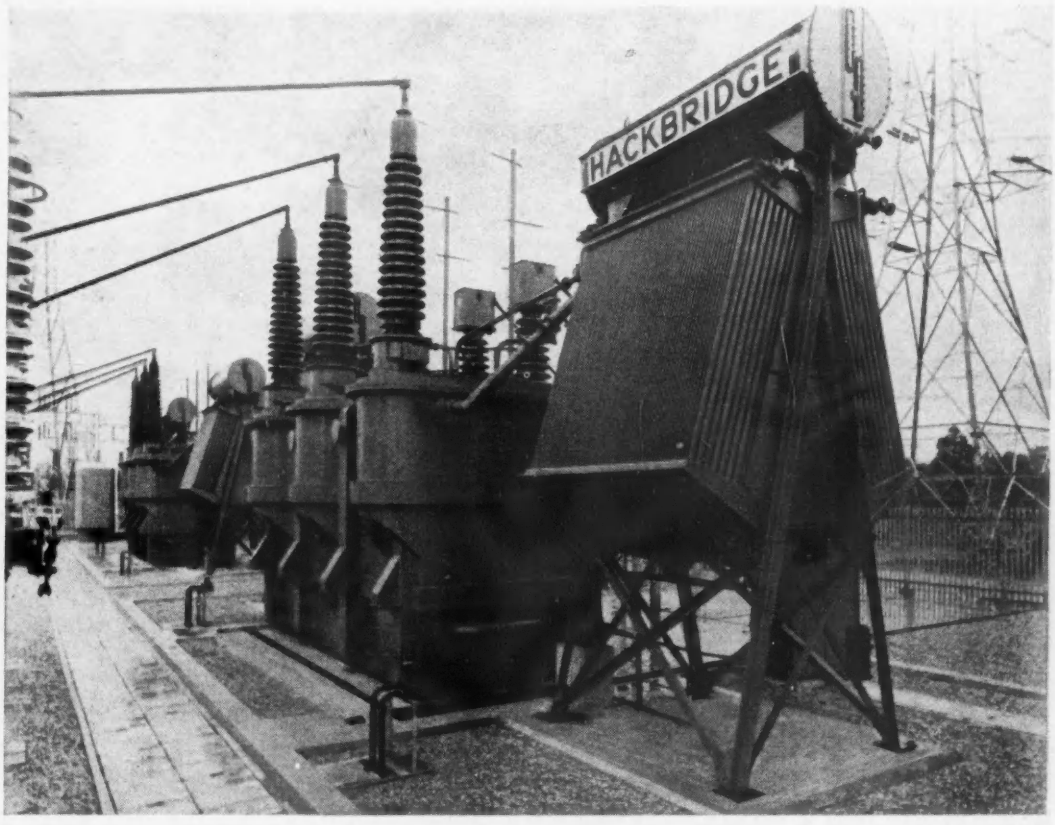
Spa. B797,945. Class 11. Dust removing and gas cleaning apparatus. Steels Eng. Installation Ltd., Crown Wks, Sunderland.

Supersil. 789,819. Class 11. Infra-red space heaters. Falk, Stadelmann and Co. Ltd., 91 Farringdon Rd, E.C.1.

The Bee-eye. B789,185. Class 9. Apparatus, etc. Pierre Cibie, 150 Avenue de Wagram, Paris, France.

Trans-Lite. 795,795. Class 9. Dials bearing information, etc. Thorn Electrical Industries Ltd. 105-109 Judd St, W.C.1.

HACKBRIDGE
275 KV
TRANSFORMERS



120 MVA

The illustration shows two 120 MVA 275/132 kV Hackbridge transformers installed at West Weybridge substation, Central Electricity Generating Board. A further similar unit is installed at Fleet whilst another is in course of manufacture.

180 MVA

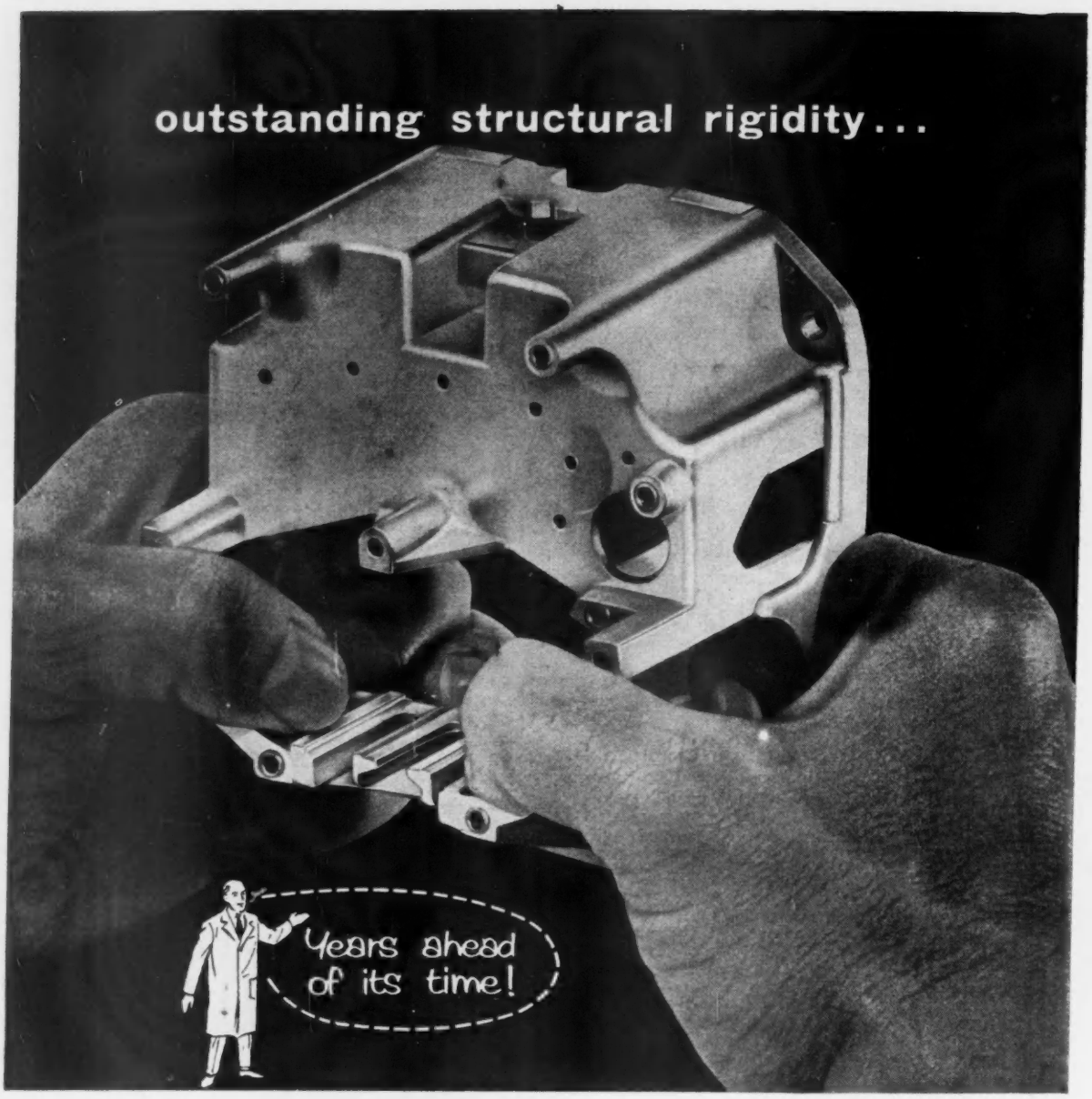
Instructions have now been received from the Central Electricity Generating Board for the manufacture of four 180 MVA 275/132 kV Hackbridge transformers, two for installation at Fleet, and one each for Exeter and Taunton.

HACKBRIDGE AND HEWITTIC ELECTRIC COMPANY LTD

HERSHAM · WALTON-ON-THAMES · SURREY

Telephone: Walton-on-Thames 28833 (8 lines) *Telegrams & Cables: "Electric, Walton-on-Thames"*

OVERSEAS REPRESENTATIVES: ARGENTINA: H. R. Roberts & Cia., S.R.L. Buenos Aires. **AUSTRALIA:** Hackbridge and Hewittic Electric Co. Ltd., 171 Fitzroy Street, St. Kilda, Victoria; N.S.W.: Queensland: W. Australia: Elder, Smith & Co. Ltd.; South Australia: Parsons & Robertson Ltd.; Tasmania: H. M. Bamford & Sons (Pty.) Ltd., Hobart. **BELGIUM & LUXEMBOURG:** Pierre Follie, Brussels, 3. **BRAZIL:** Oscar G. Mors, Sao Paulo. **BURMA:** Neonlite Manufacturing & Trading Co. Ltd., Rangoon. **CANADA:** Hackbridge and Hewittic Electric Co. of Canada Ltd., Montreal; The Northern Electric Co. Ltd., Montreal, etc. **CEYLON:** Envee Ess Ltd., Colombo. **CHILE:** Sociedad Importadora del Pacifico Ltda., Santiago. **EAST AFRICA:** G. A. Neumann Ltd., Nairobi. **EGYPT:** Giacomo Cohenca Fils, S.A.E., Cairo. **FINLAND:** Sähkö-ja Konelilke O.Y. Hermes, Helsinki. **GHANA, NIGERIA & SIERRA LEONE:** Glyndova Ltd. **GREECE:** Charilaos C. Corcneos, Athens. **INDIA:** Steam & Mining Equipment (India) Private Ltd., Calcutta; Easun Engineering Co. Ltd., Madras, 1. **IRAQ:** J. P. Bahoshy Bros., Baghdad. **MALAYA, SINGAPORE & BORNEO:** Harper, Gilfillan & Co. Ltd., Kuala Lumpur. **NETHERLANDS:** J. Kater, E.O., Ouderkerk a.d. Amstel. **NEW ZEALAND:** Richardson, McCabe & Co. Ltd., Wellington, etc. **PAKISTAN:** The Karachi Radio Co., Karachi, 3. **SOUTH AFRICA:** Arthur Trevor Williams (Pty.) Ltd., Johannesburg, etc. **CENTRAL AFRICAN FEDERATION:** Arthur Trevor Williams (Pty.) Ltd., Salisbury. **THAILAND:** Vichien Phanich Co. Ltd., Bangkok. **TRINIDAD & TOBAGO:** Thomas Peake & Co., Fort of Spain. **TURKEY:** Dr. H. Salim Oxer, Ankara. **U.S.A.:** Hackbridge and Hewittic Electric Co. Ltd., P.O. Box 234, Pittsburgh 30, Pennsylvania. **VENEZUELA:** Oficina de Ingenieria Sociedad Anonima, Caracas.



Consider this grid casting... The SANGAMO Watthour Meter embodies the very finest in materials and design. The grid casting is an outstandingly fine example of modern production technique. Made from an aluminium silicon alloy of absolute stability, it is a one-piece pressure die-casting on which no subsequent machining operations are performed. No maintenance of any sort is required. By utilising the most advanced quantity production methods in the world's most modern meter factory, it has been possible to incorporate better materials, better workmanship and better design features with the utmost economy. Thus the benefits of increased demand are passed on to the user.

SANGAMO WESTON

sangamo

MODEL S200-7 SINGLE PHASE WATTHOUR METER

SANGAMO WESTON LTD., ENFIELD, MIDDX., ENGLAND · Tel: Enfield 3434 (6 lines) & 1242 (6 lines) · Grams: Sanwest Enfield
SW/77

CLASSIFIED ADVERTISEMENTS

TENDERS INVITED

BOROUGH OF SCUNTHORPE

Electrical Wiring to Modern Standards of 243 Pre-War (1919 Act) Council Houses — Crosby Area

TENDERS are invited from approved Electrical Installation Contractors to carry out the above work. The houses are in groups of varying sizes as follows, 22, 29, 30, 73 and 89, and Contractors may submit tenders in respect of one or more groups, or in respect of the total number.

Forms of Tender and Specification may be obtained from the Housing Manager (Mr H. Atkinson, D.P.A., F.I.HSG.), Housing Department, Lincoln Gdns, Scunthorpe.

Sealed tenders must be received by the undersigned, in the envelope provided not later than noon on Monday, 7 March, 1960.

It is a provision of the contract that the successful tenderer(s) will be required to enter into a bond. The Corporation do not bind themselves to accept the lowest or any tender.

T. M. LISTER,
Town Clerk.

Municipal Offices,
34 High St,
Scunthorpe. (P 129)

WILLENHALL URBAN DISTRICT COUNCIL

TENDERS are invited for the electrical rewiring of the Town Yard at the rear of the Town Hall, Willenhall, Staffs.

Forms of tender and specification may be obtained from the office of the Engineer and Surveyor, Town Hall, Willenhall, where drawings may be inspected.

Tenders in plain sealed envelopes endorsed "Tender for Rewiring" must reach the Clerk of the Council, Town Hall, Willenhall, not later than Wednesday 2 March, 1960.

JOHN R. RIDING,
Clerk of the Council.

Town Hall,
Willenhall, Staffs. (P 130)

PETERBOROUGH RURAL DISTRICT COUNCIL

STREET LIGHTING—TRUNK ROAD A47
AILSWORTH, CASTOR AND EYE

TENDERS are invited for the erection and installation of Steel Columns and Electrical Equipment for 93 Group "A" Sodium Street Lighting Units.

Form of Tender, Specification and Bills of Quantities may be obtained from the Council's Consulting Engineers, Stirling, Maynard and Partners, 8 Station Chmbs, Peterborough, on payment of a deposit of £2 2s, to be refunded on receipt of a bona-fide Tender. Drawings and General Conditions of Contract may be inspected at the above address.

Tenders, in plain sealed envelopes endorsed "Street Lighting A47," must be received by the undersigned not later than Friday, 26 Feb., 1960.

The Council does not bind itself to accept the lowest or any Tender.

G. W. WRIGHT,
Clerk of the Council.

51 Priestgate,
Peterborough.
8 Feb., 1960. (P 139)

BUCKLEY URBAN DISTRICT COUNCIL

Tenders for Group "A" Lighting

TENDERS are invited from experienced Contractors for the following lighting work to be carried out over a length of approximately 7,200 yards, namely:—

(a) Supply, erection and internal wiring of 25ft concrete columns, 140 W sodium vapour discharge lamps, lanterns, control gear, etc.

(b) Supply only of 140 W sodium vapour discharge lamps, lanterns, control gear, various outreach pole brackets, etc.

The Contract documents may be obtained from the Surveyor, Council Chambers, Buckley, Flintshire, upon application, accompanied by a deposit of two guineas which will be returned upon receipt of a bona-fide Tender not subsequently withdrawn.

Sealed Tenders, marked "Tender for Group 'A' Lighting," must be submitted so as to reach the undersigned not later than 10 a.m. on 7 March, 1960.

STEVEN E. LIGO,
Clerk of the Council.

Council Chambers,
Buckley, Flintshire. (P 128)

APPOINTMENTS VACANT

EASTERN ELECTRICITY BOARD

Suffolk Sub-Area

THIRD ASSISTANT ENGINEER
NORTH-EAST SUFFOLK DISTRICT
25/60.R.

CANDIDATES should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground systems (including substations) at voltages up to and including 33 kV.

Salary: N.J.B., Class F, Grade 9 (£815/£860).

The successful candidate will be required to reside within reasonable proximity of Beccles. He will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Apply by letter to J. H. Shepherd, A.M.I.E.E., Manager, North-East Suffolk District, Eastern Electricity Board, The Grove, Ingate, Beccles, Suffolk, by 22 Feb., 1960.

General Construction Department

(a) FITTER (ELECTRICAL)
26/60.N.

(b) FITTER'S MATE (ELECTRICAL)
27/60.N.

Applications are invited from suitably qualified persons for the positions of Fitter (Electrical) and Fitter's Mate (Electrical) operating from the Sub-Area Central Construction Department, Stowmarket.

Applicants should preferably have had experience with 33,000 volt systems.

The rates of pay, at present as under, and the conditions of employment will be in accordance with the N.J.I.C. Agreement for the Electricity Supply Industry.

(a) 61·75d per hour.

(b) 52·75d per hour.

Apply by letter to the Secretarial Officer, Suffolk Sub-Area, Eastern Electricity Board, Finborough Hall, Stowmarket, Suffolk, by 22 Feb., 1960. (P 118)

THE NORTH EASTERN ELECTRICITY BOARD

Tees Sub-Area

APPLICATIONS are invited for the appointment of SECOND ASSISTANT DISTRICT ENGINEER, Stockton. Applicants should be suitably qualified engineers, with experience in the construction, operation and maintenance of overhead and underground networks and associated plant and equipment.

Salary: Schedule A, Class F, Grade 7, £910/£955. N.J.B. conditions of service.

Applications stating age, qualifications and experience, to be received by Assistant Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol Hse, Newcastle upon Tyne 1, within ten days of the appearance of this advertisement. (P 120)

SURREY COUNTY COUNCIL

APPLICATIONS invited for appointment of ELECTRICAL ENGINEERING ASSISTANT, Grade 1 (£610/£765 p.a. plus up to £30 p.a. London allowance according to age). Must hold H.N.C. or have passed Section A of I.E.E. and be experienced in layout and design of electrical installations in buildings.

Candidates will be appointed at the appropriate point within the scale according to age and ability.

Full details, present salary and three copy testimonials to County Architect, County Hall, Kingston, as soon as possible. (P 68)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

CROYDON TRANSMISSION DISTRICT
THIRD ASSISTANT ENGINEER
Vacancy No. 38/60.

REQUIRED for Operation and Maintenance duties. Qualifications should include possession of H.N.C. and experience in transmission work would be an advantage. Superannuation and sick pay schemes. Salary within range £975/£1,190, including London Allowance. Applications giving age, experience, qualifications, etc., to Personnel Officer, Central Electricity Generating Board, Lower Ham Rd, Kingston upon Thames. Closing date 26 Feb., 1960.

W. H. DUNKLEY,
Divisional Controller.
(P 114)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

INSTALLATION ENGINEERS

APPLICATIONS are invited for positions as Installation Engineers in the Coatbridge, Hamilton, Motherwell and Rutherglen Districts.

Applicants should be trained electricians with experience in all types of electrical installations and have a knowledge of the testing of installations and be conversant with the Electricity Supply Regulations (1937) and the I.E.E. Regulations for the Electrical Equipment of Buildings. Technical qualifications to Ordinary National Certificate or higher standard would be an advantage.

The salary and conditions of service for these appointments will be in accordance with the National Joint Board Agreement, Schedule A. The Classification and Grading for the respective Districts is as follows: Coatbridge, H.9, £910/£955; Hamilton, F.9, £815/£860; Motherwell, G.9, £860/£905; Rutherglen, G.9, £860/£905.

Application forms may be obtained from the undersigned or any other Area Manager, and should be returned to this office not later than 22 Feb., 1960.

R. J. RENNIE,
Manager.

Montrose Cres,
Hamilton. (P 127)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2 before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 40s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

CENTRAL ELECTRICITY GENERATING BOARD
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

SENIOR DRAUGHTSMAN (ELECTRICAL)
TRANSMISSION DEPARTMENT
DIVISIONAL HEADQUARTERS
Vacancy No. 10/60.

Applicants for this appointment must have suitable technical training and be experienced in the design and layout of H.V. Substations and Switch-houses, also the preparation of the necessary associated circuitry diagrams.

Experience in the design and construction of H.V. transmission lines with steel towers will be an added advantage.

The salary will be in accordance with Grade 4 of Schedule D of the National Joint Board Agreement and will be within the range £930/£1,030 per annum.

Closing date for receipt of applications: 19 Feb., 1960.

SENIOR DRAUGHTSMAN
(CIVIL ENGINEERING AND BUILDING)
TRANSMISSION DEPARTMENT
DIVISIONAL HEADQUARTERS
Vacancy No. 11/60.

Applicants for this appointment must have suitable technical training and be thoroughly conversant with the design and detailing for civil and building works, including steel and R.C. structures and foundations.

The work is associated with H.V. Substations and Generating Stations and experience in this type of work will be an advantage.

The salary will be in accordance with Grade 4 of Schedule D of the National Joint Board Agreement and will be within the range £930/£1,030 per annum.

Closing date for receipt of applications: 19 Feb., 1960.

FOURTH ASSISTANT ENGINEER
TRANSMISSION DEPARTMENT
DIVISIONAL HEADQUARTERS
Vacancy No. 12/60.

Experience in maintenance and operation of 132 kV Transmission Lines and Substations essential.

Candidates should preferably have qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

The salary will be in accordance with Class AX/EX, Grade 7 (£840/£1,065 per annum) of Schedule B of the National Joint Board Agreement.

Closing date for receipt of applications: 19 Feb., 1960.

SHIFT CHARGE ENGINEER
CASTLE DONINGTON POWER STATION
Vacancy No. 13/60.

Applicants should have had operating experience with high pressure turbo-alternators and pulverised fuel fired boilers.

Possession of technical qualifications admitting to Corporate Membership of the Institution of Mechanical and/or Electrical Engineers and also proof of indentured apprenticeship will be an advantage.

Salary will be in accordance with Class L, Grade 6 (£1,360/£1,450 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 19 Feb., 1960.

GENERAL ASSISTANT ENGINEER
LEICESTER POWER STATION
Vacancy No. 14/60.

The successful applicant will be given opportunities to obtain experience in all sections of a power station.

Preference will be given to candidates who hold the Higher National Certificate or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Salary will be in accordance with Class G, Grade 13 (£655/£700 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 19 Feb., 1960.

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GENERAL ASSISTANT ENGINEERS
CASTLE DONINGTON POWER STATION
Vacancy No. 16/60.

Applications are invited from suitably qualified men who are interested in Power Station operation and/or maintenance as a career.

Facilities are available whereby experience can be obtained in all sections of a large modern power station, and the prospects of advancement are real to those who are willing to take advantage of the opportunities.

The salary during the initial training period will depend on qualifications and knowledge and will be within the range £560/£700 per annum of the National Joint Board Agreement.

Closing date for receipt of applications: 19 Feb., 1960.

FOURTH ASSISTANT ENGINEER
COVENTRY SECTION
Vacancy No. 18/60.

Applicants should have experience of the maintenance and operation of E.H.T. overhead lines, transformers and switchgear.

Preference will be given to candidates with qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

Salary will be in accordance with Class AX/EX, Grade 8 (£735/£960 per annum), of the National Joint Board Agreement.

Closing date for receipt of applications: 26 Feb., 1960.

PLANT SHIFT CONTROL ENGINEERS
DRAKELOW "A" POWER STATION
Vacancy No. 19/60.

Experience desirable in control of boilers and turbines at high pressure and temperature, pulverised fuel, together with electrical control room experience.

Technical qualifications to Higher National Standard desirable.

Salary will be in accordance with Class J, Grade 10 (£910/£955 per annum), of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 26 Feb., 1960.

GENERAL ASSISTANT ENGINEERS
HIGH MARNHAM POWER STATION
Vacancy No. 20/60.

Applications are invited from suitably qualified men who are interested in Power Station operation and/or maintenance as a career.

Facilities are available whereby experience can be obtained in all sections of a large modern power station, and the prospects of advancement are real to those who are willing to take advantage of the opportunities.

The salary during the initial training period will depend on qualifications and knowledge and will be within the range (£560/£700 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 26 Feb., 1960.

SHIFT CHARGE ENGINEER
STAYTHORPE "B" POWER STATION
Vacancy No. 21/60.

Applicants should have had a sound technical training and considerable experience in a large modern power station. Preference will be given to applicants who are Corporate Members of the Institution of Electrical or Mechanical Engineers, or who hold similar qualifications.

Salary will be in accordance with Class K, Grade 6 (£1,270/£1,360 per annum), of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 22 Feb., 1960.

ASSISTANT SHIFT CHARGE ENGINEER
STAYTHORPE "B" POWER STATION
Vacancy No. 22/60.

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate or its equivalent.

Salary will be in accordance with Class K, Grade 8 (£1,095/£1,170 per annum), of

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the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 22 Feb., 1960.

PLANT CONTROL ENGINEER
STAYTHORPE "B" POWER STATION
Vacancy No. 23/60.

Candidates should have a sound technical training and experience of the operation of a power station, including electrical control room experience. Preference will be given to candidates who possess technical qualifications to Higher National standard.

Salary will be in accordance with Class K, Grade 10 (£965/£1,025 per annum), of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 22 Feb., 1960.

ASSISTANT SHIFT CHARGE ENGINEER
STAYTHORPE "A" POWER STATION
Vacancy No. 24/60.

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate or its equivalent.

Salary will be in accordance with Class K, Grade 8 (£1,095/£1,170 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 22 Feb., 1960.

STATION SHIFT CONTROL ENGINEER
STAYTHORPE "A" POWER STATION
Vacancy No. 25/60.

Applicants should have had a sound technical training and practical experience in a modern power station. The possession of a Higher National Certificate or its equivalent would be advantageous.

Salary will be in accordance with Class K, Grade 10 (£965/£1,025 per annum), of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 22 Feb., 1960.

ASSISTANT ENGINEERS (CONTROL ROOM)
STAYTHORPE "A" POWER STATION
Vacancy No. 26/60.

Candidates for this post should be suitably qualified and have had experience in the control room.

Salary will be accordance with Class K, Grade 14 (£765/£810 per annum), of the National Joint Board Agreement, plus £90 per annum allowance for shift duties.

Closing date for receipt of applications: 22 Feb., 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated.

O. S. WOODS,
Divisional Controller.

3 Feb., 1960. (P 98)

CENTRAL ELECTRICITY GENERATING BOARD
Midlands Division

MAINTENANCE ENGINEER (MECHANICAL)

REQUIRED at Walsall Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade J6, £1,195/£1,270 per annum.

A sound technical training and practical experience in power station mechanical maintenance is required, and the possession of appropriate technical qualifications will be an advantage.

Apply, quoting vacancy number 24/60MD on form AE6 available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 22 Feb., 1960. (P 132)

Box Number replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for following superannuable posts. Conditions of service in accordance with the N.J.B. Agreement, Schedule B. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

GENERAL ASSISTANT ENGINEERS
GENERATION DEPARTMENT
(VARIOUS POWER STATIONS)
Vacancy No. 60/71.

Opportunities exist in London Division Power Stations for:

General Assistant Engineers who wish to gain experience in power station operation and maintenance. Promotional prospects are good and minimum commencing technical qualification required is O.N.C. (Mechanical or Electrical) or First Class M. of T. Certificate. Salary: Class AX/EX, Grade 9, £610/£685 per annum (starting range).

THIRD ASSISTANT ENGINEER
TRANSMISSION DEPARTMENT
DIVISIONAL HEADQUARTERS
GENERATION HOUSE
Vacancy No. 60/72.

Applicants should preferably be Corporate or Graduate Members of the Institution of Electrical Engineers or possess other equivalent qualifications, and should have experience in the design, layout and installation of Substation plant, including the preparation of schemes, specifications and estimates, together with a knowledge of site testing and commissioning of Substation plant. Salary: Class AX/EX, Grade 6, £975/£1,220 per annum.

FOURTH ASSISTANT ENGINEER
(MAINTENANCE SECTION)
TRANSMISSION DEPARTMENT
DIVISIONAL HEADQUARTERS
GENERATION HOUSE
Vacancy No. 60/73.

Applicants should have had a sound technical training, preferably with qualifications leading to Corporate Membership of the I.E.E., and experience in the maintenance of high voltage switchgear, transformers, lines and cables. With the expected growth of the Grid System in the London Area, these positions offer great opportunities for experience in transmission practice up to the highest voltages. Salary: Class AX/EX, Grade 8, £775/£1,010 per annum, with possible promotion to Grade 7, £890/£1,115 per annum.

Applications, quoting vacancy number to (or on form from) Personnel Officer, Central Electricity Generating Board, London Division, P.O. Box 136, London W.1, by 22 Feb., 1960. (P 97)

FEDERAL GOVERNMENT OF NIGERIA

ELECTRICAL INSPECTOR

UNDER the Chief Inspector to inspect electrical supply undertakings and large consumers' installations including factories, mines and oilwells, and to investigate and conduct enquiries into electrical accidents.

Contract appointment for one or two tours. Salary range £1,374/£1,788. Gratuity of £37 10s for each three months' satisfactory service. Quarters at moderate rent. Free passages. Allowance for children maintained in United Kingdom. Generous home leave.

Candidates must be A.M.I.E.E. or be exempt the Institution's examination and have been apprenticed to an electrical supply undertaking or large industrial undertaking with at least seven years' experience of responsibility involving the planning, erection and maintenance of electrical transmission and distribution systems or works electrical plants. A thorough knowledge of electrical supply and wiring regulations as they apply in the United Kingdom is essential.

Write Director of Recruitment, Colonial Office, London S.W.1, stating full names, age, qualifications and experience, quoting BCD 99/14/014/D10. (P 89)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Glasgow Area

Vacancy Reference No. T/60/5.

DISTRICT COMMERCIAL ENGINEER
(SOUTHERN DISTRICT)

APPLICATIONS are invited for the above post.

Applicants should be Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications and have experience in the various applications of electricity, a knowledge of installation work and be conversant with tariffs, sales and all aspects of service to consumers.

The terms and conditions of employment will be in accordance with the Agreement of the National Joint Board for the Electricity Supply Industry.

Salary scale: £1,360/£1,450 per annum, Class H, Grade 3.

The successful candidate will require to reside within reasonable distance of the District Headquarters.

Applications, quoting the above reference number, should be made on the standard form which may be obtained from the undersigned and should be returned within 14 days of the appearance of this notice.

A. KELSO,
Manager.

P.O. Box 6,
75 Waterloo St,
Glasgow C.2. (P 107)

UNIVERSITY COLLEGE OF SWANSEA

ENGINEERING CLERK OF WORKS

ENGINEERING Clerk of Works required by the University College of Swansea to supervise a number of Mechanical and Electrical Sub-contracts in connection with building developments at the College. Candidates must be not less than 30 years of age and possess technical qualifications up to National Certificate standard, Mechanical and/or Electrical Engineering or be Graduate or Associate Members of the Institution of Electrical Engineers or I.H.V.E.

Preference will be given to applicants who have experience and knowledge of electrical installations and also good previous experience in site supervision of engineering works.

The inclusive salary will be in the range of £1,000/£1,150 per annum according to experience. Applications should be addressed to the Architects, Sir Percy Thomas and Son, 10 Cathedral Rd, Cardiff, giving full particulars of age, qualifications and experience. The closing date for applications is 27 Feb., 1960. (P 113)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

Central Gloucestershire Sub-Area

GENERAL ASSISTANT DISTRICT ENGINEER
(CHELTENHAM)

Applicants will be required to assist generally in the construction, maintenance and operation of H.V. and L.V. Mains. Technical qualifications desirable. Salary: £655/£700 per annum (N.J.B. Grade F.12).

Apply, by letter, within 14 days, stating age, experience, present position and salary to Mr S. Raybould, Sub-Area Manager, Midlands Electricity Board, Eastern Ave, Gloucester.

Wolverhampton and District Sub-Area

GENERAL ASSISTANT DISTRICT ENGINEER
(EVESHAM)

Applicants should have had experience in the operation and maintenance of Distribution Systems, and will be required initially to assist in the Planning Section. Technical qualifications desirable. Salary: £710/£755 per annum (N.J.B. Grade F.11).

Apply, by letter, stating age, education, experience, qualifications, present position and salary to Mr R. Mallet, Sub-Area Manager, Midlands Electricity Board, P.O. Box 52, Blackpole Rd, Worcester.

F. W. CATER,
Secretary.
(P 104)

CENTRAL ELECTRICITY BOARD OF THE FEDERATION OF MALAYA

APPLICATIONS are invited from suitably qualified FEDERAL CITIZENS OF THE FEDERATION OF MALAYA for the posts of ELECTRICAL ENGINEERS (DIVISION I).

Monthly salary scales

TIME SCALE B:
Between $740 and $950 for a single man.
Between $870 and $1,140 for a married man.
Between $870 and $1,195 for a married man with family.

TIME SCALE A:
Between $1,000 and $1,254 for a single man.
Between $1,190 and $1,430 for a married man.
Between $1,265 and $1,505 for a married man with family.

Candidates, who must be at least 24 and below 40 years of age, must have had a good general education and be Corporate Members or Graduates of the Institution of Electrical Engineers or possess degrees or other educational qualifications carrying exemption from the Institution Graduateship Examinations. They should have had sound training in both Electrical and Mechanical Engineering and experience in the operation of Electricity Supply Undertakings. They should possess a competent knowledge of the erection and maintenance of high- and low-tension overhead and underground A.C. distribution systems and substation plant. Experience in the operation and maintenance of diesel engines an advantage.

Write to the Crown Agents, 4 Millbank, London S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/50326/EE. (P 88)

LONDON ELECTRICITY BOARD

ENGINEERING DRAUGHTSMAN

APPLICATIONS are invited for the above position in the Board's Northern District at Clapton, E.5.

Candidates should possess the Ordinary National Certificate and be able to prepare system diagrams, obtain cable particulars on site and compile accurate permanent records. Some knowledge of electrical plant layout, building construction and simple reinforced concrete structures would be an additional advantage.

The post is graded under Schedule D of the National Joint Board Agreement as Grade 6, £660/£780 per annum, inclusive of London Allowance.

Application forms obtainable from the Personnel Officer, 46 New Broad St, London E.C.2, to be returned completed within 14 days of the publication date of the notice. Please quote ref. PER/V/2857/T. (P 106)

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following appointments:

MAINTENANCE ENGINEER
(MECHANICAL)
RYE HOUSE GENERATING STATION
(HODDESDON, HERTS)

Salary: N.J.B., Class G, Grade 6, £1,025 x £20—£1,085 per annum.

Applicants should have served an apprenticeship and have had experience with the maintenance of modern pulverised fuel fired boilers, turbines and coal and ash handling plants. Operating and supervisory experience and technical qualifications to at least Ordinary National Certificate (Mechanical) standard will be of advantage.

Applications, quoting reference S.V. No. 1264, stating age, qualifications, experience and present position, should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, to arrive not later than 20 Feb., 1960.

W. N. C. CLINCH,
Controller.
(P 103)

YORKSHIRE ELECTRICITY BOARD

Head Office

ASSISTANT CHIEF ENGINEER
(OPERATION AND MEASUREMENTS)

A CHARTERED Electrical Engineer is required to take charge of the Operation and Measurements Section of the Chief Engineer's Department, with responsibility for system operation and also technical work in connection with measurements, protection, communications and electronics. Ability to conduct and supervise technical work of this nature is essential.

Salary: N.J.M., Class C, Grade 7, £2,360/£2,560 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Secretary, Yorkshire Electricity Board, Wetherby Rd, Scarcroft, Leeds, not later than 7 March, 1960.

No. 3 (Sheffield) Sub-Area

SHEFFIELD DISTRICT

ASSISTANT ENGINEER (CONTRACTING)

Applicants should have had experience in estimating, tendering for and supervising electrical installation work and in preparing specifications, either with a Supply Authority or a firm of electrical contractors.

The successful candidate will be employed in the Electrical Installation Contracting Department.

Salary: N.J.B., Class L, Grade 11, £965 x £20—£1,025 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 26 Feb., 1960.

No. 5 (Wakefield) Sub-Area

WAKEFIELD DISTRICT

ASSISTANT CONSUMERS' ENGINEER

This post offers an opening for a young man with the technical standard of the Ordinary National Certificate in Electrical Engineering who has preferably already had some training in installation work. He will be given training in the various aspects of commercial work in the District dealing with new and increased supplies to small industrial and commercial consumers, street lighting negotiations and tariff queries. He will initially be required to supervise the installation inspectors and to render general assistance to the Consumers' Engineer.

Salary: N.J.B. Class G, Grade 13, £655 x £15—£700 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 26 Feb., 1960. (P 121)

LONDON ELECTRICITY BOARD

APPRENTICE INSTRUCTOR

APPLICATIONS are invited for a post as Apprentice Instructor at the Board's Training Centre, located at Camden Town, N.W.1.

The Instructor will work under the Senior Apprentice Instructor and he should have been a skilled craftsman with some previous experience in instructing. He should be capable of teaching any of the basic workshop skills with hand or machine tools and initially he will be responsible for the Machine Shop Section.

The post is graded under Schedule B of the National Joint Board Agreement as Class AX/EX, Grade 8, and the salary range will be £775 per annum to £1,010 per annum, inclusive of London Allowance. The successful candidate will be required to work such hours as may be necessary in order effectively to supervise apprentices under instruction.

Application form obtainable from the Personnel Officer, 46 New Broad St, London E.C.2, to be returned completed within 14 days of the date of publication of this notice. Please quote ref. PER/V/2859/T. (P 125)

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

GENERAL ASSISTANT ENGINEERS
(OPERATION)

Vacancy SW/AV/16/60.

REQUIRED at Plymouth "B" Power Station.

Superannuation Scheme. Salary: N.J.B., Class H, Grade 13, £710/£755 per annum, plus £90 Shift Allowance.

Preference will be given to candidates who hold or are at present studying for a Higher National Certificate or similar qualification.

Closing date: 18 Feb., 1960.

THIRD ASSISTANT ENGINEER

Vacancy SW/AV/20/60.

Required in the Generation Department at Divisional Headquarters, Bristol.

Superannuation Scheme. Salary: N.J.B., Class AX/DX, Grade 6, £925/£1,140 per annum.

The successful candidate will be required to assist in Operational Research investigation directed towards greater economy, efficiency and availability in the field of generation.

Applicants must have qualifications leading to membership of a professional institution. Previous experience in statistics, method study, O. & M. or other investigational work would be considered an advantage.

Opportunities will be available for training.

It is essential that applicants should have an inquiring mind and an aptitude for logical reasoning.

Closing date: 20 Feb., 1960.

Applications on Form A.E.6/ACT obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by the date stated. (P 123)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

SENIOR ASSISTANT ENGINEER
(DIVISIONAL MECHANICAL MAINTENANCE)

REQUIRED in the Chief Generation Engineer's Department. N.J.B. service conditions, superannuable appointment, salary within Schedule B, Grade 2 of the Agreement, commencing in range £1,475/£1,600, and ultimately rising to £1,740 per annum.

Applicants should preferably be corporate members of the Institution of Mechanical Engineers, and should have had wide experience of the mechanical maintenance problems connected with the generation of electricity.

Apply, quoting Vacancy No. 25/60MD on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 4 March, 1960. (P 131)

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following position:

FOURTH ASSISTANT ENGINEER
(PLANNING)
CHIEF ENGINEER'S DEPARTMENT
BRISTOL

Salary according to Class AX, Grade 7, £840 x £25—£965 per annum of revised Schedule B of the N.J.B. agreement, with further progression to £1,040 (Class DX).

Duties will include the preparation and technical assessment of reinforcement and development schemes for the Board's E.H.V., H.V. and L.V. systems, the examination of load-flow diagrams and estimation of future trends, and the preparation of schemes for long-term reinforcement.

Applicants should be either Engineering Graduates or have passed the Higher National Certificate in Electrical Engineering, and should have had some experience of the construction, operation and maintenance of distribution equipment.

Applications to be made on standard form AE6/ACT, OBTAINABLE BY POSTCARD ONLY, from the Establishments Officer, South Western Electricity Board, Colston Ave, Bristol 1. Closing date for receipt of completed applications 27 Feb., 1960. (P 87)

THE EAST MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced persons for the following appointments:

Northamptonshire Sub-Area

(1) ENGINEERING DRAUGHTSMAN

Salary: N.J.B., Schedule D, Grade 6, £620 x £20—£740 per annum.

The duties will include the preparation of schematic and system diagrams and drawings of overhead line supports, switchgear and structures and substation layouts.

A technical qualification in mechanical or electrical engineering would be an advantage.

(2) FOURTH ASSISTANT ENGINEER
(SHIFT OPERATION)

Salary: N.J.B., Class K, Grade 12, £860 x £15—£905 per annum, plus 10% shift allowance.

Candidates should have had experience of switching operations on a high-voltage distribution system, preferably including both urban and rural networks. Experience in the issue and cancellation of Permits to Work under the C.E. Safety Rules, or acting as Control Engineer for part of a high-voltage system, would be an advantage.

Applications, stating age, education, experience, qualifications, present position and salary, should be forwarded to the Manager, Northamptonshire Sub-Area, 25 Bridge St, Northampton, not later than 25 Feb., 1960. (P 117)

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER

WORTHING DISTRICT

SALARY £765/£810 per annum. Class F, Grade 10. Superannuable. Applicants should be technically trained to H.N.C. standard, with practical knowledge and experience of M.V. and H.V. distribution systems. Rented housing accommodation may be available.

Applications, quoting ET and naming two referees, to District Manager, Seeboard, 56 Chapel Rd, Worthing, by 24 Feb., 1960.

ENGINEERING DRAUGHTSMAN

CROYDON AND WEST KENT SUB-AREA HEADQUARTERS

Salary £660/£780 p.a. including London Allowance under N.J.B. Schedule D6. Superannuable. Applicants must be good draughtsmen with a sound general education and adequate engineering knowledge, preferably with experience in the layout of substations and switchgear, cable records and site plans.

Applications, quoting ET and naming two referees, on forms from Croydon and West Kent Manager, Seeboard, Electric Hse, Wellesley Rd, Croydon, by 24 Feb., 1960.

ASSISTANT DISTRICT ENGINEER

CRAWLEY AND HORSHAM DISTRICT

Salary within the range £815/£860 under N.J.B. Class F, Grade 9. Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead distribution systems up to 11 kV. The successful applicant will be required to reside within the District and undertake standby duties. Subject to certain conditions, housing accommodation may be available at Crawley.

Applications, quoting ET and naming two referees, to District Manager, 50/52 The Broadway, Crawley, by 24 Feb., 1960.

ASSISTANT DISTRICT ENGINEER

BRIGHTON AND HOVE DISTRICT

Salary £860 x £15—£905 per annum under N.J.B. Class H, Grade 10. Superannuable. Applicants should possess the H.N.C. in electrical engineering or its equivalent and have had training and experience in the construction, operation and maintenance of underground H.V. and M.V. distribution systems.

Applications, quoting ET and naming two referees, to District Manager, Seeboard, Electric Hse, Castle Sq, Brighton, by 24 Feb., 1960.

GEORGE WRAY,
Secretary.
(P 119)

CITY OF BIRMINGHAM PUBLIC WORKS DEPARTMENT

Mechanical & Public Lighting Section

VACANCY FOR ELECTRICAL ENGINEER
SPECIAL GRADE, £785/£1,070 p.a.

APPLICANTS should be Associate Members of the Institution of Electrical Engineers or hold the Higher National Certificate.

Candidates should have experience of lighting engineering with particular reference to public lighting.

The post is permanent, superannuable and subject to a medical examination.

Applications stating qualifications, age and experience and naming two referees should reach the undersigned by 5 March, 1960.

Canvassing disqualifies.

HERBERT J. MANZONI,
City Engineer and Surveyor.

Civic Centre,
Birmingham 1. (P 126)

WAR DEPARTMENT

Central Power Station, Aldershot

SHIFT ENGINEER—TECHNICAL GRADE III

A VACANCY exists at provincial salary scale £680 at age 26 to £850 p.a., plus shift disturbance allowance, 6s 6d per shift. Qualifications are Ordinary National Certificate or equivalent in Electrical and/or Mechanical Engineering and five years' apprenticeship or similar comprehensive training. Applicants should have at least three years' experience in charge of operation and maintenance of generating plant and switchgear (steam and diesel).

Applications in writing to CEPO, HQ, Aldershot District, Aldershot, quoting reference No. ET/1. (P 21)

BOROUGH OF POOLE

ELECTRICAL ENGINEERING ASSISTANT
GRADE III (£880/£1,065)

APPLICATIONS for the above post are invited from properly trained electrical engineers of not less than Higher National Certificate standard.

Applicants must have had design and estimating experience as consumers' or contracts engineers, and be capable of supervising works on contract sites. The work will be related to the internal and external electrical installations met with in the Council's engineering and architectural branches, and some knowledge of street lighting would be an asset.

Application forms and details of the appointment are available from the Borough Engineer, Municipal Bldgs, Poole, Dorset, and must be returned to the undersigned not later than Saturday, 27 Feb., 1960.

J. G. HILLIER,
Town Clerk.
(P 122)

GOVERNMENT OF JAMAICA

Ministry of Trade and Industry (Electricity Division)

CHIEF ENGINEER

DUTIES include technical and administrative supervision of the Electricity Division; advising on electrical development and on the issuing of licences to supply undertakings; investigating and reporting on electrical accidents; inspection and certification of electrical installations and distribution and transmission lines, etc.

Contract appointment for three years. Salary £2,000 a year. Gratuity 20% of salary. Free passages. Rented quarters.

Candidates, up to 50 years, must be A.M.I.E.E. with at least 10 years' relevant practical experience, preferably in an administrative capacity. Mechanical engineering qualifications would be an advantage.

Write to Director of Recruitment, Colonial Office, London S.W.1, giving full names, age, qualifications and experience, quoting BCD 149/32/05/D10. (P 90)

SOUTHERN ELECTRICITY BOARD

INSTALLATION ASSISTANT

SWINDON District of No. 2 (Newbury) Sub-Area. Salary: N.J.B., Class F, Grade 11. £710 x £15—£755 per annum, with N.J.B. conditions of service, but present trends indicate that the District may be reclassified to Class G from April 1, 1960.

Applicants should have had experience in the preparation of specifications and estimates for all types of electrical wiring installations. They should be competent to supervise electricians and organise the allocation of work.

The successful candidate will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks, and returned to him, quoting Z.1100, not later than 22 Feb., 1960. (P 124)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT CONSUMERS ENGINEER

REQUIRED in the Northwich District of the Board's No. 2 Sub-Area. Salary within range £710/£755 per annum (N.J.B. F/11).

Duties will include estimating for contracting work and advising consumers on matters relating to electricity supply and the utilisation of electrical equipment. Technical qualifications desirable.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 2 Sub-Area, Sandiway Hse, Northwich, Cheshire.

Closing date: 22 Feb., 1960. (P 116)

NORTHAMPTON COLLEGE OF ADVANCED TECHNOLOGY, LONDON E.C.1

APPLICATIONS are invited, especially from those in industry, for the following additional appointments:

(a) SENIOR LECTURER IN ELECTRONICS.
(b) LECTURER IN ELECTRONICS OR MEASUREMENTS.
(c) LECTURER IN GENERAL ELECTRICAL ENGINEERING.
(d) ASSISTANT LECTURER IN ELECTRONICS.

The work of the department is concerned with the B.Sc.(Eng.) Internal Degree of the University of London, Sandwich Dip. Tech. (Eng.), Post Graduate Courses in Electrical Engineering and Full-time Research.

The posts also provide facilities for research, development and experience in industrial liaison. Applicants should possess a Degree in Electrical Engineering, and will be encouraged to read for a Higher Degree.

SALARY SCALES:

SENIOR LECTURER, £1,550 x £50—£1,750 per annum.

LECTURER, £1,370 x £35—£1,550 per annum.

ASSISTANT LECTURER, £895 x £27 10s—£1,345 per annum.

Plus, in each case, a London Allowance of £38 increasing to £51 at age 37. Starting salary dependent upon industrial or teaching experience.

Particulars and form of application from the Secretary, Northampton College of Advanced Technology, St. John St, E.C.1. (P 138)

A CONSULTANT with a sound theoretical and practical knowledge of the design and production of small (decimal h.p.) induction motors is invited to contact a Midland Manufacturer.—Apply Box No. 7701, Electrical Times. (P 50)

ELECTRICAL ENGINEERS

required with experience in the installation of L.T. and E.H.T. Cables, switchgear, transformers, etc. Good conditions and prospects. Reply stating age, experience, qualifications and salary required to Box No. 7699, Electrical Times. (P 49)

Hawker Siddeley

INDUSTRIAL DIVISION

BRUSH ELECTRICAL ENGINEERING COMPANY LIMITED

ASSISTANT SWITCHGEAR SPECIALIST ENGINEER

The Brush Electrical Engineering Company Limited are seeking a Switchgear Engineer with a technical and commercial background and preferably a Graduate or Associate Membership of the Institution of Electrical Engineers. The successful man must be capable of discussing switchgear applications with customers' engineers and of preparing technical publicity.

Applications, WHICH WILL BE TREATED IN THE STRICTEST CONFIDENCE, should give brief details of experience and qualifications and should be addressed to the

Chief Personnel Officer,
Brush Electrical Engineering Co. Ltd.,
Loughborough, Leics.,

and should quote reference: PL9035.
(P 105)

ASSISTANT WORKS MANAGER for small cable works. Practical experience of all rubber and plastic operations including mixing imperative, and preferably experience of planning and incentive schemes. Write stating age, experience and salary required.—Box No. 7710, Electrical Times. (P 102)

DRAUGHTSMEN required for Consulting Engineers' Office, to assist in the design of lighting and power installations for all classes of buildings. Five-day week. Spring and summer holidays. Pension Scheme and Luncheon Vouchers. Apply in writing stating age, experience, present salary and salary required to: J. Roger Preston and Partners, 15 North Audley St, W.1. (P 140)

JOHNSON & PHILLIPS LTD.

have vacancies for

CABLE JOINTERS

Experienced Power Cable Plumber Jointers required for Western Nigeria and Ghana for work up to 11 kV.

OVERHEAD LINESMEN

Experienced men required for work in Ghana.

ASSISTANT ENGINEERS

For Contract Department at Charlton. Preference given to young men with some experience in preparing estimates and tenders for Underground and Industrial Power layouts. Some training might be given to other suitable applicants not possessing this experience.

Applicants in writing stating age, training and experience to:

Employment Manager,
Johnson and Phillips Ltd.,
Victoria Way,
Charlton, S.E.7. (P 91)

KENT COUNTY COUNCIL

APPLICATIONS are invited from Corporate Members of the Institution of Electrical Engineers for the appointment of SENIOR ELECTRICAL ENGINEER on the permanent staff of the Buildings Department. Candidates must have had considerable experience in the design and supervision of electrical installations in all types of buildings.

SALARY within scale £1,280/£1,485. Commencing salary according to experience. N.J.C. conditions of service.

APPLICATION FORMS and further details from County Architect, Springfield, Maidstone.

Closing date: 25 February, 1960.

(P 48)

EKCO-ENSIGN ELECTRIC LTD. require SENIOR LIGHTING ENGINEER conversant with modern lighting practice for Birmingham office.—Apply Manager, 68 Caroline St, Birmingham 3. (P 96)

ELECTRICAL ENGINEER required for Head Office Staff. Degree or Graduate Membership of I.E.E. and practical training at manufacturer of electrical machines. Upper age limit 35. Progressive salary with non-contributory pension. Applications stating age, nationality, qualifications and experience to British Engine Boiler and Electrical Insurance Co. Ltd., Longridge Hse, Manchester 4. (P 112)

ELECTRICAL CONTRACTOR with small firm in South of England, seeks RIGHT-HAND MAN, preferably between 30 and 50. Must be good organiser, capable of controlling staff of approximately 10 electricians, and be able to estimate for contracts up to £4,000. Splendid opportunity for the right type of person. Apply with full details and copies of two recent testimonials to Box 7715, Electrical Times. (P 134)

ALLEN WEST

SALES ENGINEERS

Allen West and Co. Ltd., Brighton, manufacturers of Electric Motor Control Gear and Switchgear, have vacancies for Sales Engineers in the Contracts Section of their Head Office Sales Department. The Company operates a five-day week, has a generous staff Pension Scheme and provides good staff canteen facilities. In addition an Incentive Award is paid to all employees in the form of a quarterly bonus.

Applicants should be aged between 21-27 years, be in possession of the Ordinary National Certificate (or higher qualification) and be totally free of National Service commitments.

Applications in writing, giving full details of age, education, qualifications and experience, should be addressed to:

The Personnel Manager,
ALLEN WEST & CO LTD
BRIGHTON 7

(P 81)

ELECTRICAL MANAGER (ASSISTANT)

Clyde Shipyard building all types Merchant and Naval vessels requires Assistant Electrical Manager undertaking control of Drawing Office, Plant and Ship installations. Previous experience of A.C. systems essential. Candidates should have at least H.N.C. or equivalent qualifications. Good prospects of early promotion. Excellent Staff Pension and Life Assurance Schemes; house available. Applications stating age, detailed experience, technical qualifications and salary required, write **2710, William Porteous and Co., Glasgow.** (P 59)

ESTIMATING ENGINEER required immediately by Cardiff office of National Electrical Contractors. Write in confidence, stating experience, salary required, to Box No. 7703, Electrical Times. (P 86)

JUNIOR TECHNICAL ASSISTANT, age 20-28, for preparation of lighting schemes, illuminating engineering department in old-established manufacturers of lighting equipment. Five-day week. Pension fund. Apply stating experience to Chief Engineer, Technical Service Department, Holophane Ltd., Elverton St, Westminster, S.W.1. (P 22)

A PROFESSIONAL ELECTRICAL ENGINEER

is required by the

ATOMIC ENERGY ESTABLISHMENT
WINFRITH, DORSET

to work in a team responsible for the design, specification and commissioning of electrical equipment and installations for research reactors and associated experimental equipment.

Applicants should have served a recognised engineering apprenticeship or have had equivalent training and be corporate members of the Institution of Electrical Engineers or possess equivalent qualifications.

Salary: In the range £860 (at age 25)/£1,340 per annum.

Housing and superannuation schemes.

Send postcard for application form to Personnel Branch (W238/49), U.K.A.E.A., A.E.E., Winfrith, Dorchester, Dorset, not later than 8 March, 1960. (P 110)

QUALIFIED ELECTRICAL DESIGN ENGINEER required to work in Jamaica on power and lighting schemes for building projects. Work includes design and supervision. Some knowledge of other building services and air conditioning an advantage. Apply in writing giving full details of age, experience and U.K. salary required (successful candidate will work in London office initially) to: Norman and Dawbarn, Architects and Consulting Engineers, 7 Portland Pl, London W.1. (P 108)

ELECTRICAL ENGINEER

required by the Copper Development Association to assist in the Electrical Engineering Department. Candidates should have professional qualifications of degree standard and some years' practical experience. The work involves dealing with technical matters arising from the use of copper and copper alloys in the electrical industry. Preferred age 25-34. A generous non-contributory Superannuation Scheme is in force. Details of training and experience should be marked "Confidential" and sent to the **Secretary at 55 South Audley St, London W.1.** (P 101)

ELECTRICAL DRAUGHTSMAN

required for electrical section of Design Department. Experience in preparation of H.T. and L.T. cabling diagrams, cable schedules and schematic diagrams. Knowledge of electrics associated with large chemical works plants desirable. Qualifications: O.N.C.

Write: Personnel Manager,
AIR PRODUCTS (G.B.) LTD.,
49/50 Poland Street,
LONDON, W.1.

(P 111)

MEDIUM Tension Switchgear Manufacturer requires experienced REPRESENTATIVE for the London Area.—Box No. 7717, Electrical Times. (P 136)

QUALIFIED ELECTRICAL ENGINEER with experience of design and construction of overhead and underground electrical supply networks up to 33 kV required for Iran. Apply in writing stating full details to Staff Officer, British Insulated Callender's Construction Co. Ltd., 30 Leicester Sq, London, W.C.2. (P 133)

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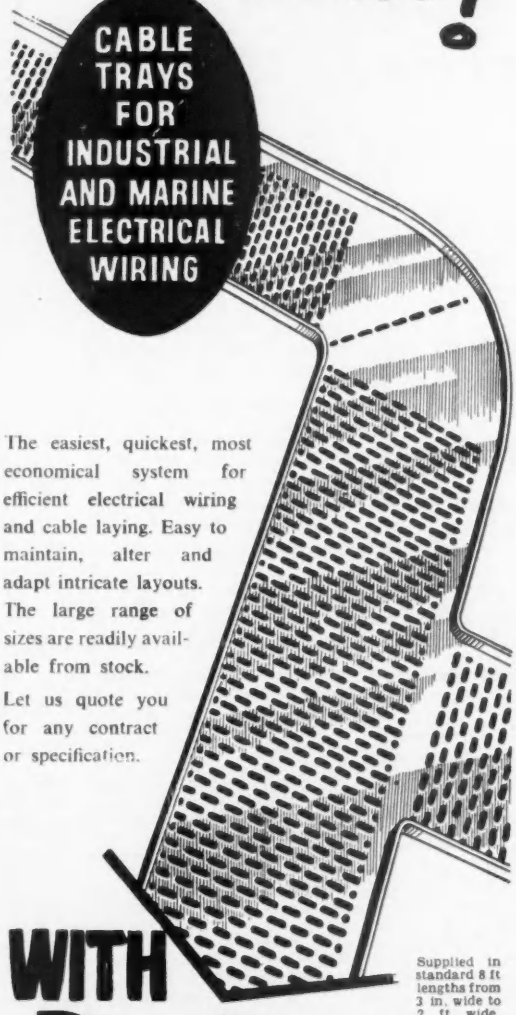

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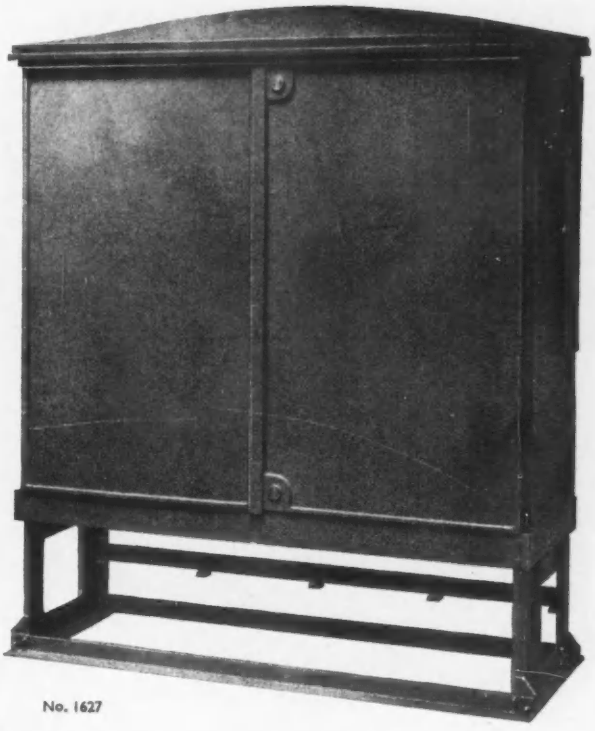

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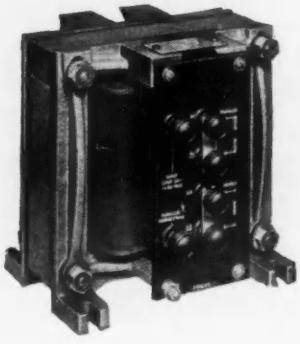

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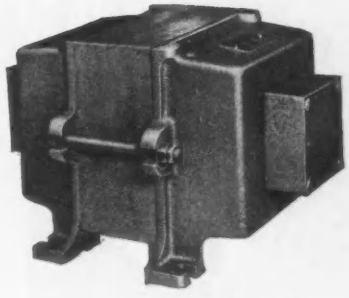

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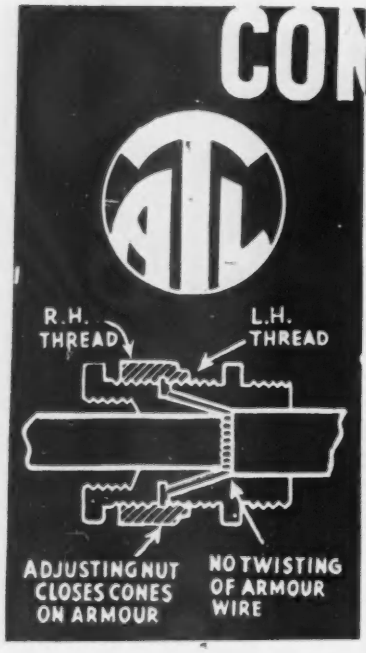

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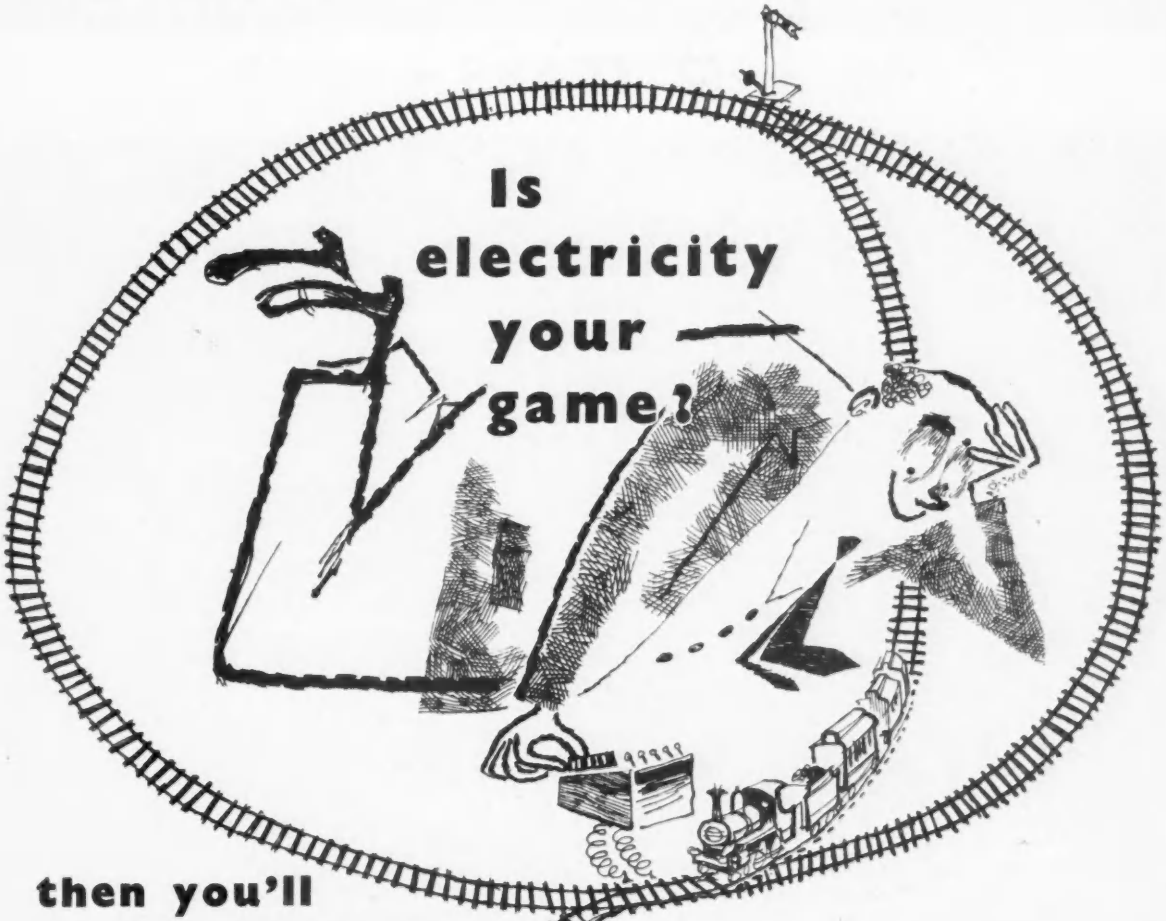

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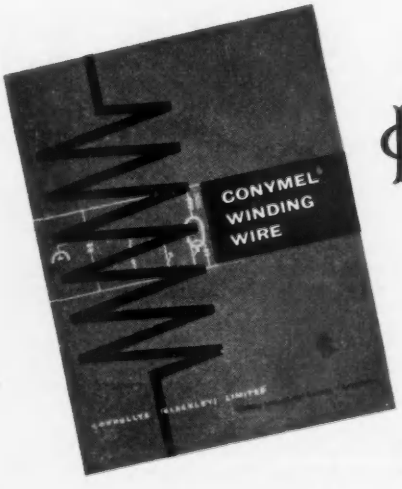

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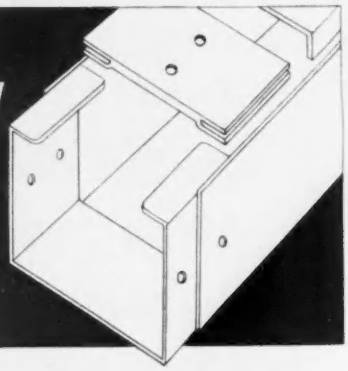

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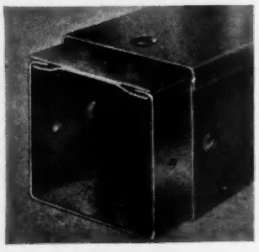

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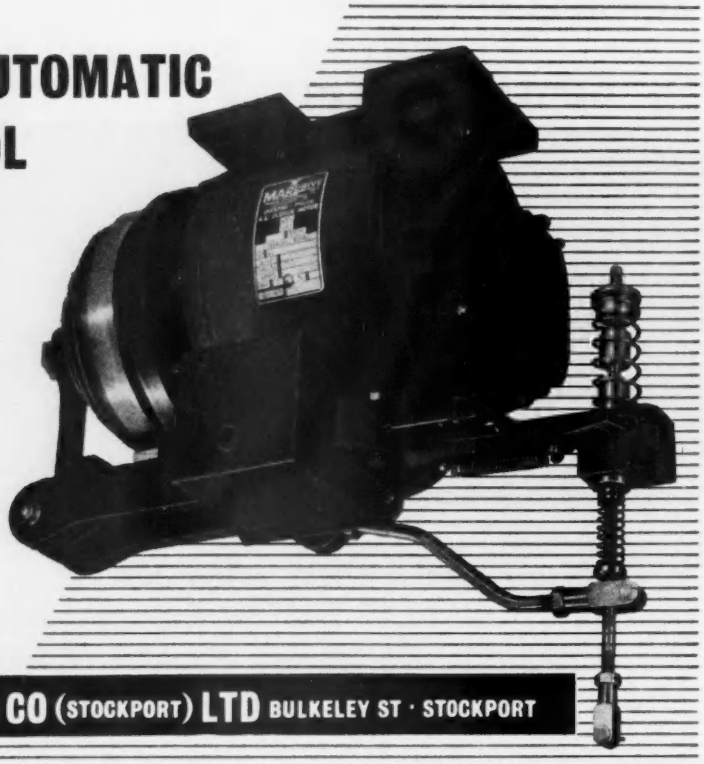

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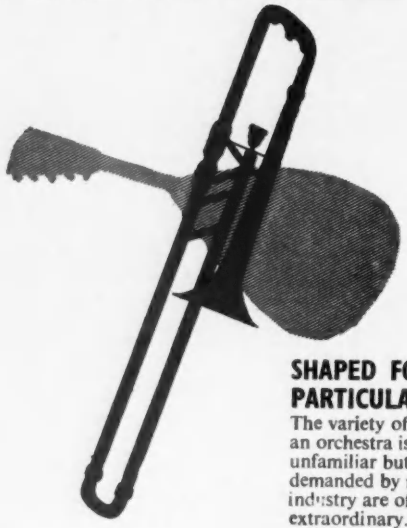

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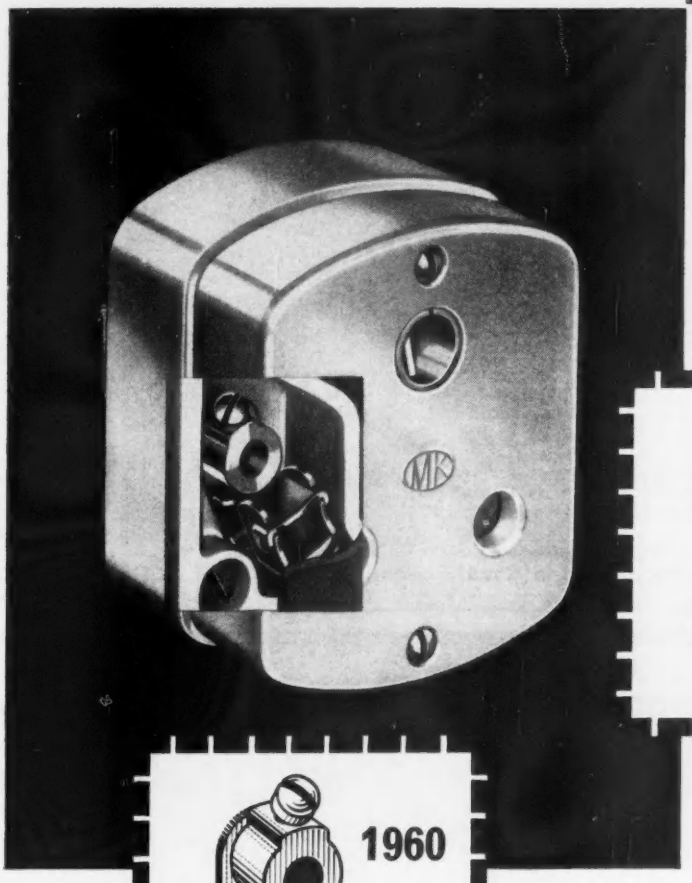

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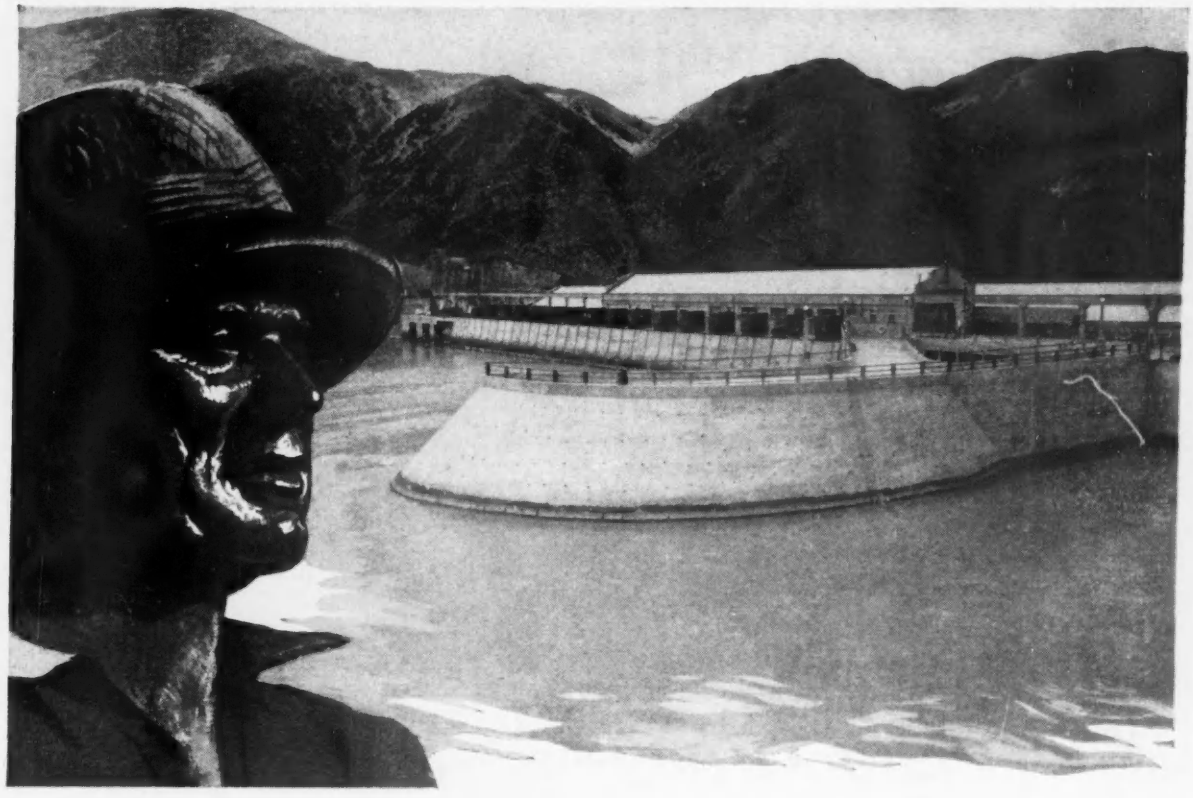

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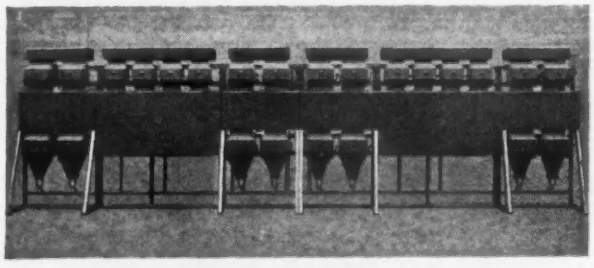

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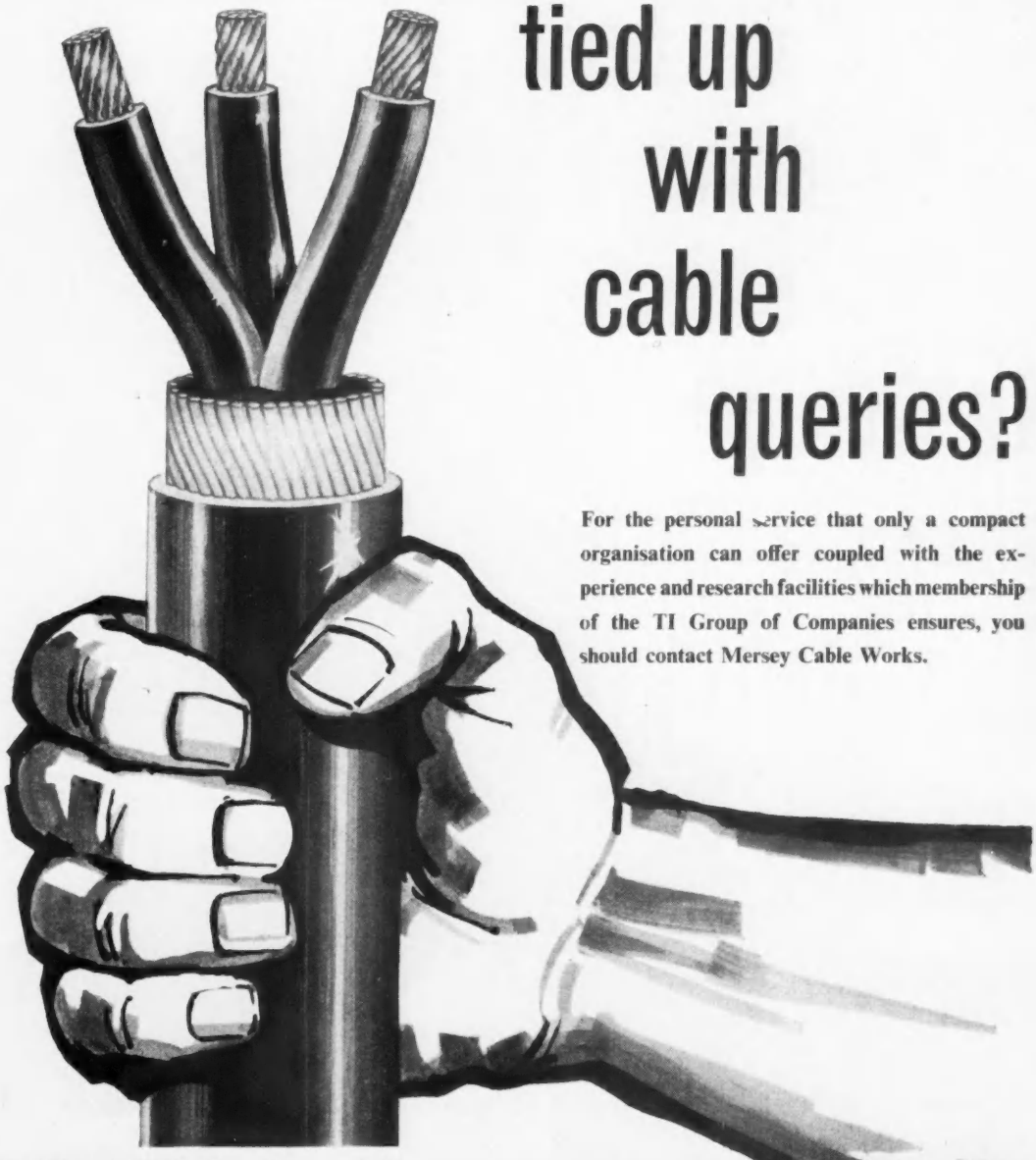

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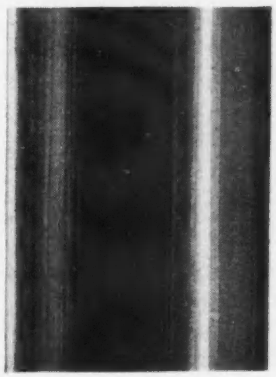

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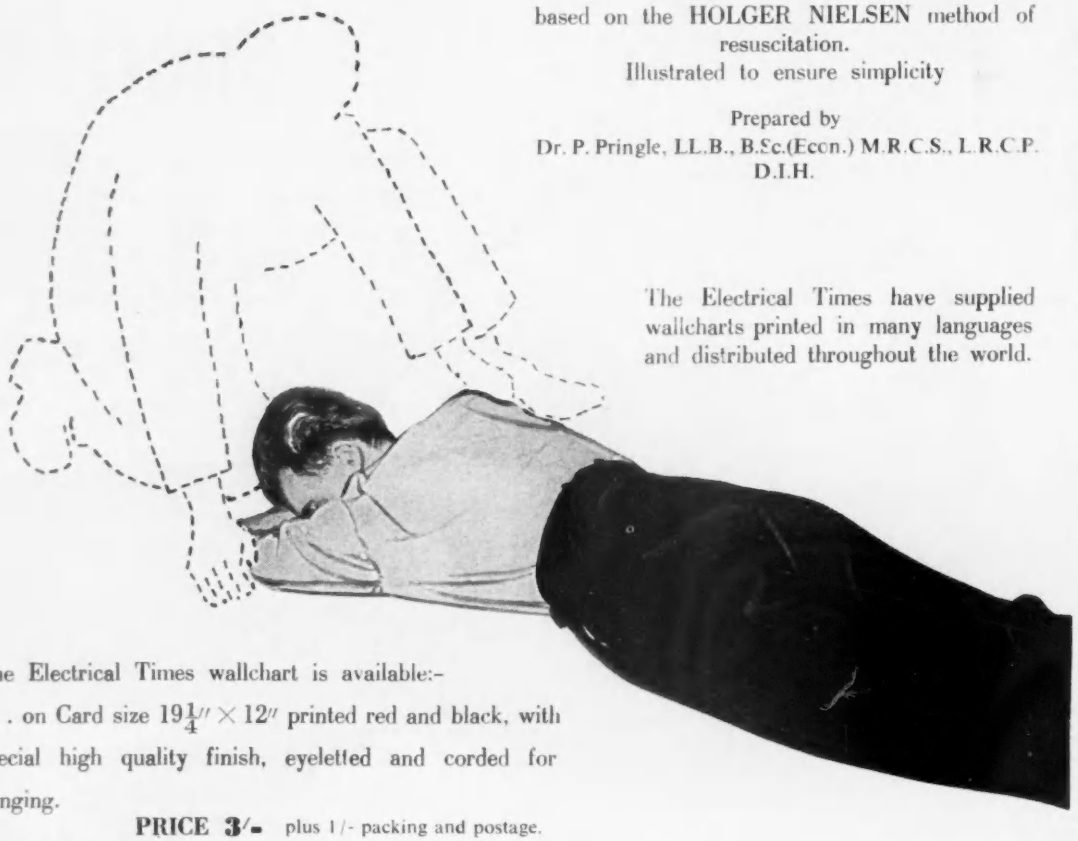

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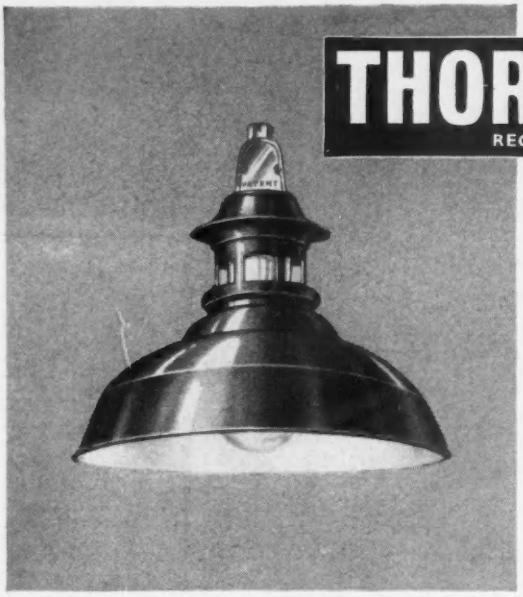

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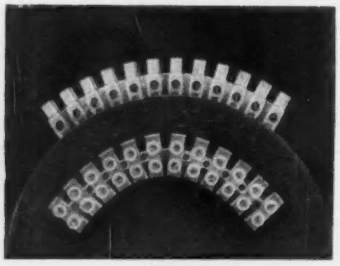

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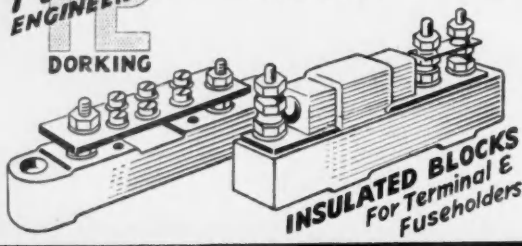

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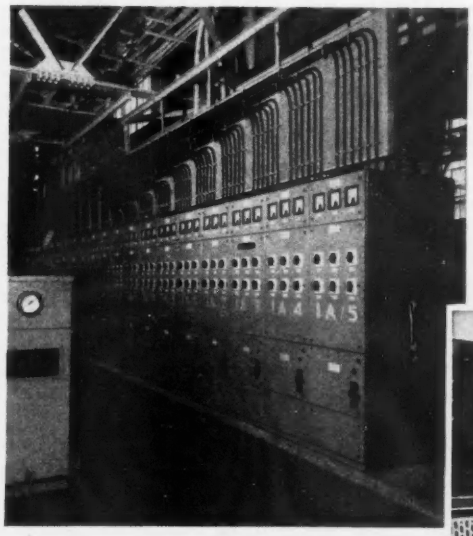

Main control switchboard at one of the United Kingdom Atomic Energy Authority Research Establishments showing Pyrotenax cables feeding lighting, power and instrument circuits.

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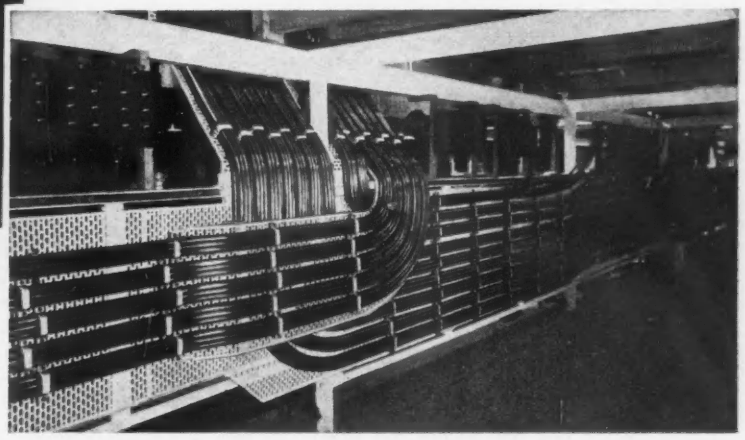

Power and instrument cabling at the rear of the main switchboard. (Contractor N. G. Bailey Limited Leeds.)

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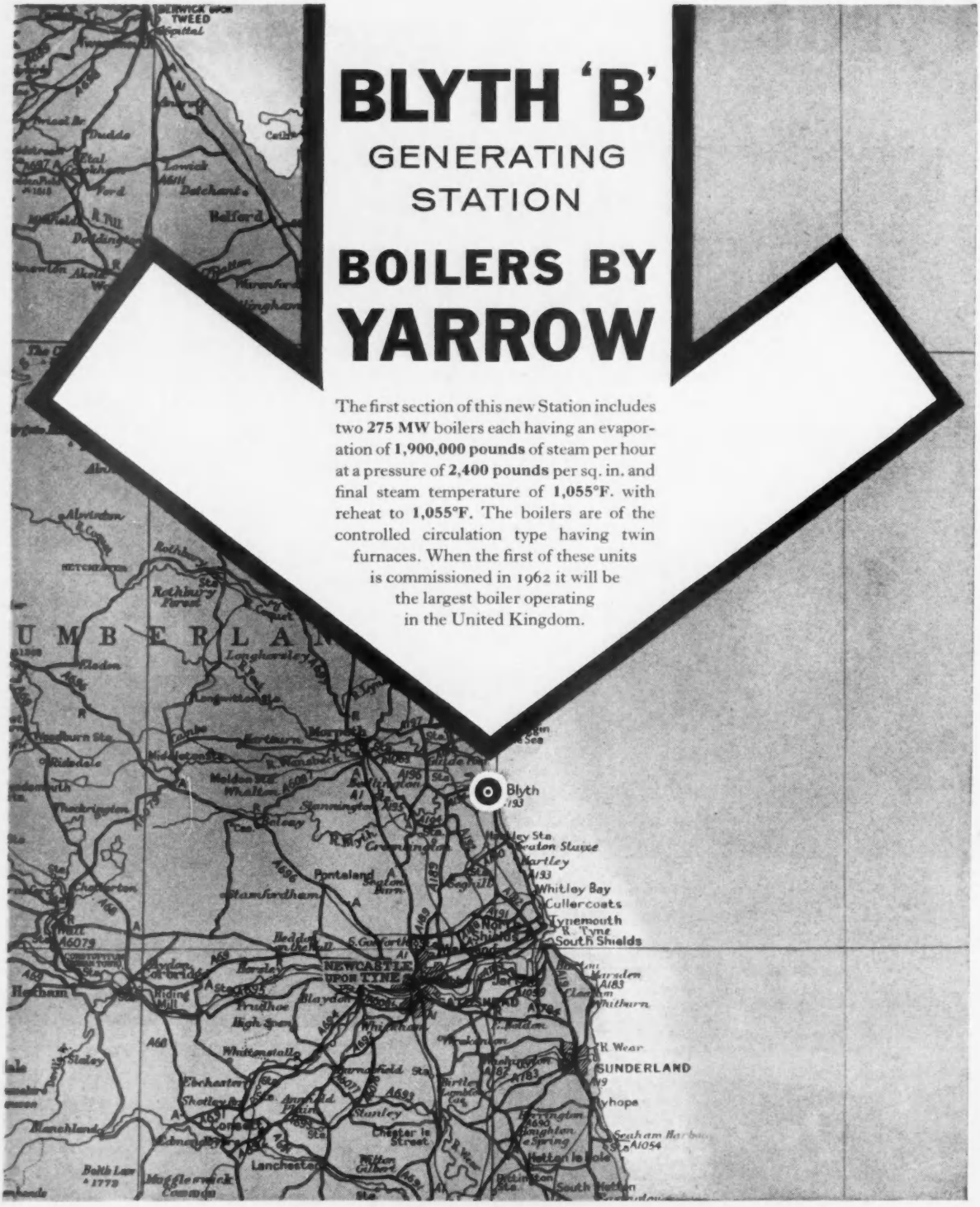

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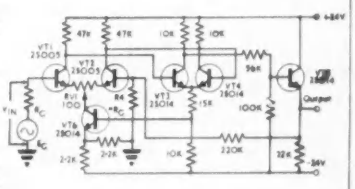

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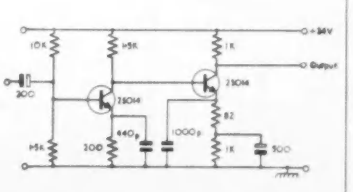

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